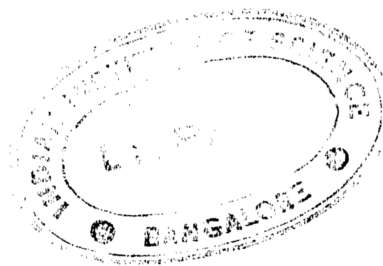
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REPORTS ON OIL-SEEDS



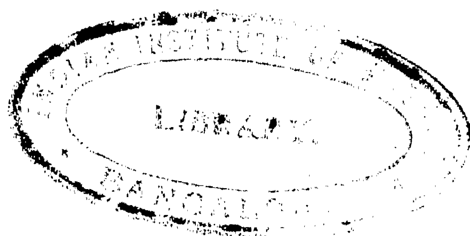
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REPORTS ON OIL-SEEDS



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REPORTS of the INDIAN TRADE ENQUIRY

HIDES AND SKINS
RICE
OIL-SEEDS
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TIMBERS AND PAPER MATERIALS
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INDIAN TRADE ENQUIRY

Special Committee on Oil-Seeds

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Sir John P. HEWETT, G.C.S.I., K.B.E., C.I.E.
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PREFATORY NOTE

In August 1916 the Secretary of State for India invited the Imperial Institute Committee for India to conduct an enquiry into the possibilities of further commercial usage in the United Kingdom of the principal Indian raw materials. It was also proposed that the enquiry should include the possibility of the usage of these materials in other parts of the Empire.

The invitation was accepted by the Committee for India, and a number of Special Committees were formed to deal with the principal groups of materials selected for inclusion in the Indian Trade Enquiry.

The groundwork for the consideration of the various Committees has been supplied from the information as to the raw materials concerned which has been systematically collected at the Imperial Institute, chiefly in the Scientific and Technical Department and in the Technical Information Bureau.

The Committee have also had at their disposal the numerous reports made by the Scientific and Technical Department of the Institute during recent years on the composition and commercial uses and value of Indian raw materials, and have also utilised the collection of raw materials of India, derived partly from Technical Departments in India and partly from commercial sources, which are included in the Indian Section of the Public Galleries and in the Reference Sample Rooms of the Institute.

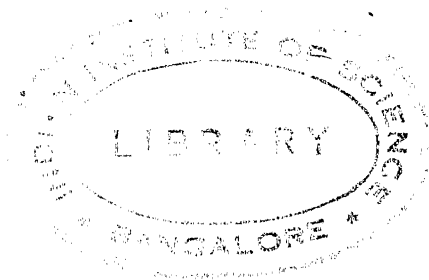
It has now been decided by the Secretary of State that, subject to certain reservations, the reports of these various Committees, which have been forwarded by the India Office to the Government of India, shall be published.

The reservations referred to are that at the request

of the Government of India paragraphs in certain of the reports as presented should be omitted, such paragraphs being indicated by asterisks, and that it should be stated that the reports represent the personal opinions of the members of the Committees, and that the Secretary of State is in no way committed to accept these opinions.

C. C. McLEOD,
Chairman, Committee for India.

November 1919.



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REPORTS ON OIL-SEEDS

I

THE TRADE IN INDIAN OIL-SEEDS

THE Special Committee appointed by the Indian Committee of the Imperial Institute to consider the trade of India in oil-seeds consisted of Sir Charles H. Armstrong (Chairman), Sir John P. Hewett, G.C.S.I., K.B.E., C.I.E., Sir Marshall F. Reid, C.I.E., and the late Mr. George Allen, with Dr. T. A. Henry, of the Imperial Institute, as Secretary. At its first meeting the Special Committee decided to invite Mr. A. Bigland, M.P., Ministry of Food, and Mr. J. W. Pearson, Chairman of the Seed Crushers' Association of the United Kingdom, to join the Committee, and these gentlemen kindly consented to serve.

The Special Committee have endeavoured to consult every branch of the trade and industry interested in Indian oil-seeds, and they desire to place on record their cordial appreciation of the assistance rendered by all the firms and associations consulted, including especially the following :

Shippers of Indian Oil-seeds.—Messrs. Ralli Brothers ; Messrs. Becker, Gray & Co.

Oil-seed Brokers in London.—The Produce Brokers Co., Ltd. ; Messrs. W. Boese & Co.

Oil-seed Crushers in India.—Messrs. Steel Brothers & Co., Ltd. ; Messrs. Milne & Co.

Oil-seed Crushers and Makers of Edible Fats in the United Kingdom.—The Seed Crushers' Committee of the Hull Chamber of Commerce and Shipping ; Messrs. Loders & Nucoline, Ltd. ; Messrs. The Maypole Dairy Co., Ltd.

Importance of the Trade in Oil-seeds

Before proceeding to deal with the immediate subject of the enquiry, it may be well to point out the importance of the trade in oil-seeds and of the industries dependent thereon to India, the United Kingdom, and the Empire as a whole. Perhaps the most important feature of this trade is the extent to which oil-seeds are used, indirectly, as a foodstuff for man. A great part of the oil-seeds of commerce is employed for the extraction of oil or fat, which is refined for use in the edible-fat industry, and the proportion so used is steadily increasing. Oils, such as those of rape seed and linseed, which have until recently only been used for industrial purposes in Europe, can now be so efficiently refined as to be employed in making margarine, and large quantities of rape-seed oil have been used in this way in recent years, especially on the Continent. Cotton-seed and other oils can now also be converted, by the process of hardening by hydrogenation, into solid fats, thus adding to the world's resources of solid fats suitable for edible purposes.

No less important is the use of oils and fats in the manufacture of soap, in the course of which glycerine is obtained as a by-product. As glycerine is essential for the manufacture of modern propellant explosives, there is no need to enlarge on the importance of this branch of the industry.

Large quantities of oils and fats are also used as lubricants, and in this connection special reference may be made to castor oil, which is the lubricant *par excellence* for aeroplane and similar work, and is therefore a war material of first-rate importance.

Mention must also be made of the varnish and paint industries, for which drying oils, such as those of linseed and poppy seed, are essential. Large quantities of special oil varnishes are used in the production of high-explosive shells.

Finally, the residues—cakes and meals—left after the expression or extraction of oils and fats from oil-seeds constitute an asset of ever-increasing importance for feeding

cattle, and are therefore indirectly of great importance as food for human beings.

OIL-SEEDS PRODUCED IN INDIA

India probably produces in commercial quantities a greater variety of oil-seeds than any other country. The following are the most important Indian oil-seeds :

Copra . . .	Yielding solid fats.
Mowra seed . .	
Cotton seed . .	Yielding liquid, non-drying oils.
Sesame seed . .	
Castor seed . .	
Rape seed . .	
Ground-nuts . .	
Linseed . . .	Yielding liquid, drying oils.
Poppy seed . .	
Niger seed . .	

The foregoing classification of these oil-seeds into three groups, according to the nature of the fat or oil contained, is of interest, especially in connection with the technical uses of the oils. From the point of view of the oil-seed crusher, it is more convenient to classify them according to the yield of fat or oil, as follows :

Group A.—Seeds rich in oil, i.e. containing 45 *to* 70 *per cent. of oil:*

Ground-nut.	Mowra seed.	Copra.
Sesame seed.	Castor seed.	

Group B.—Seeds less rich in oil, i.e. containing from 13 *to* 40 *per cent. of oil:*

Linseed.	Cotton seed.	Poppy seed.
Rape seed.	Niger seed.	

The importance of this method of classification lies in the fact that different types of oil-seed-pressing plant are required for the two groups. In the United Kingdom most of the oil-mills are provided with plant for expressing seeds belonging to Group B, though a certain number of mills, especially since the war, have been provided with equipment for dealing with the richer oil-seeds belonging to Group A. In mills where extraction by solvents is resorted to, either group of seeds can be dealt with, and there is little doubt that this method will gradually replace for most seeds the manufacture of oil by expression.

India's Proportion of the World's Exported Surplus of Oil-seeds

In the following table, figures for the estimated world's exported surplus in 1913 of the oil-seeds in which India is particularly interested are given alongside India's exported surplus in 1913–14 of the same seeds. For the sake of simplicity, one year only has been taken, viz. the last year of normal trade before the war, which has also the advantage of being a year which fairly represents the trend of trade in recent years. The figures have been compiled from the trade returns of the exporting countries.

Name of seed.	World's exported surplus, 1913 (estimated).	India's exported surplus, 1913–14.	Proportion of India's to the World's exported surplus.
	Tons.	*Tons.*	*Per cent.*
Copra	537,000	38,000	7
Mowra seed	Not available[1]	33,000	100
Cotton seed	900,000	284,000	31
Sesame seed	264,000	112,000	42
Castor seed	137,000	135,000	98
Rape seed	385,000	249,000	65
Ground-nut	780,000	383,500[3]	45
Linseed	2,150,000	414,000	20
Poppy seed	25,000[2]	19,000	76
Niger seed	Not available[1]	4,000	100

[1] *No exports recorded from countries other than India.*
[2] *Rough estimate only.*
[3] *Including about* 105,500 *tons mostly grown in British India but exported via French Possessions in India.*

Of the seeds dealt with in this table, India has a virtual monopoly only in the cases of mowra seed, castor seed, and possibly niger seed; but even in these cases the monopoly is apparent rather than real. Mowra seed can hardly be considered apart from other seeds yielding fats, interchangeable with mowra fat. Similarly, castor seed is now being grown in Manchuria, and oil expressed from this Manchurian seed is being exported from China. Further, castor seed can be grown in almost any part of the tropics and is easily cultivated, so that production outside India can easily be undertaken. In the other seeds India has obviously no monopoly, and it becomes a matter of great importance to consider in these cases

to what extent India is dependent on foreign countries for a market.

It is probable that, in future, oil-seeds will be utilised in India to an even greater extent than at present for the production of oil and cake. The following table, summarising the Indian production and export of oil-seeds in 1913–14, indicates the extent to which oil-seeds are already used in the country itself. Figures for each of the years 1912–13 to 1916–17 are given in Table II appended to this Report.

Indian Production and Export of Oil-seeds and Oil-seed Products, 1913–14

Article.	Estimated production.	Export.
Ground-nuts (tons)	749,000	383,500[1]
Ground-nut cake (tons)	—	62,000
Ground-nut oil (gallons)	—	288,200
Linseed (tons)	386,000	414,000[2]
Linseed oil (gallons)	—	102,400
Rape seed (tons) / Mustard seed (tons)	1,087,000	249,000 / 5,000
Rape or mustard oil (gallons)	—	407,000
Sesame seed (tons)	403,500	112,000
Sesame oil (gallons)	—	208,000
Linseed cake (tons) / Rape cake (tons) / Sesame cake (tons)	—	89,500
Cotton seed (tons)	2,110,000	284,000
Cotton cake (tons)	—	10,400
Cotton oil (gallons)	—	2,500
Castor seed (tons)	—	135,000
Castor cake (tons)	—	4,900
Castor oil (gallons)	—	1,007,000
Coconut (copra) (tons)	—	38,000
Coconut cake (tons)	—	4,200
Coconut oil (gallons)	—	1,091,500
Mowra seed (tons)	—	33,000
Poppy seed (tons)	30,000	19,000
Niger seed (tons)	—	4,000
Other oil-seeds (tons)	—	900
Other cakes (tons)	—	4,200
Other oils (gallons)	—	135,300

[1] *Including exports of ground-nuts chiefly grown in British India but shipped via French-Indian ports.*

[2] *Partly derived from crop of previous season.*

It will be seen that the bulk of the oil-seeds produced in India are already used in the country, with the exception of linseed, which before the war appears to have been

nearly all exported. This use of oil-seeds in India is not always economically sound. For example, large quantities of cotton seed are said to be fed direct to cattle in certain parts of India. It would be better to express or extract the oil and use only the residual cake or meal for feeding purposes.

Principal Markets for India's Exports of Oil-seeds

Table III appended shows the chief destinations of India's exports of oil-seeds, oil-cakes, and oils in 1913–14, as given in the Indian Trade Returns.

It will be seen that the United Kingdom in 1913–14 was the most important of India's European customers for the following products: coconut oil, cotton seed and cake, castor seed and oil, linseed.

Germany took chiefly linseed, rape seed, sesame seed, copra, coconut oil, and mowra seed.

France took principally ground nuts, linseed, rape seed, sesame seed, castor seed, and poppy seed.

Belgium was a large purchaser of oil-seeds from India, taking principally rape seed, linseed, sesame seed, and castor seed, and also a considerable amount of coconut oil. Much of the produce sent to Belgium was, however, ultimately destined for Germany.

Italy and Austria-Hungary took linseed and sesame seed in considerable quantities; the latter was also a purchaser of ground-nuts, and the former was a fairly large market for castor seed. In view of the considerable transit trade in oil-seeds to Austria-Hungary from Germany (see Table IVB), it is possible that some of India's exports of oil-seeds to Germany ultimately went to Austria-Hungary.

Table III makes it clear that France and Germany took from India principally oil-seeds rich in oil, such as ground-nuts, sesame, copra, and mowra, whilst the United Kingdom took chiefly the seeds poor in oil, such as linseed and cotton seed. Further, France took from India no oil-cake and only small quantities of oils. Germany was a moderately good customer for both these products, though inferior to the United Kingdom, at least as regards quantities.

Relative Importance of the Chief European Countries as Consumers of Oil-seeds

In Table IV (Sections A to F) appended, an attempt is made to estimate the relative importance of the chief oil-seed, oil, and oil-cake importing and exporting countries, and the position India held before the war as a source of supply to each of them.

The figures are taken from the import returns of the various countries concerned and are for the year 1913, except in the case of Germany, for which detailed figures are not available after 1912. The figures for imports from India often differ considerably from the exports to the same countries as shown in the Indian Trade Returns. These discrepancies are due chiefly to the difficulty of ascertaining the final destination of exports in the exporting country, and in part to the custom in some European countries of ascribing indirect imports to their original source.

The salient features of this lengthy table may be summarised as follows:

United Kingdom, 1913	*Tons.*
Total imports of oil-seeds, oils, and cakes	2,119,085
Total imports of oil-seeds, oils, and cakes from India	486,018
Total exports of oil-seeds, oils, and cakes	249,418
Total transit trade of oil-seeds, oils, and cakes	25,782

Germany, 1912[1]	*Metric tons.*
Total imports of oil-seeds, oils, and cakes	2,415,193
Total imports of oil-seeds, oils, and cakes from India	329,057
Total exports of oil-seeds, oils, and cakes	384,435
Total transit trade of oil-seeds, oils, and cakes	209,270[2]

France, 1913	
Total imports of oil-seeds, oils, and cakes	1,270,558
Total imports of oil-seeds, oils, and cakes from India	408,109[2]
Total exports of oil-seeds, oils, and cakes	397,030
Total transit trade of oil-seeds, oils, and cakes	4,700

Belgium, 1913	
Total imports of oil-seeds, oils, and cakes	880,418
Total imports of oil-seeds, oils, and cakes from India	178,272
Total exports of oil-seeds, oils, and cakes	430,925
Total transit trade of oil-seeds, oils, and cakes	67,415

[1] *Detailed figures for* 1913 *not available.*
[2] *Oil-seeds only.*

United States, 1913

Total imports of oil-seeds, oils, and cakes . . .	436,297
Total imports of oil-seeds, oils, and cakes from India .	21,649
Total exports of oil-seeds, oils, and cakes . . .	798,037

This summary indicates, at first sight, that Germany had become in 1912 the most important seed-crushing and trading country in Europe. This statement is, however, subject to a number of qualifications, which become apparent when the detailed table is consulted. Thus Germany's total imports, as shown in the Summary, were unduly swollen by the large imports (over 800,000 metric tons) of oil-cakes as against only 406,700 tons imported to the United Kingdom. The imports of oil-seeds to the United Kingdom were larger than the imports to Germany, though the value was smaller, due to Germany's purchase of the more valuable oil-seeds, copra, palm kernels, etc. The British imports of oil were almost twice as great as the imports of oils to Germany, both in quantity and value. Further, large quantities of the fully manufactured article, margarine (not included in the tables), were imported to the United Kingdom, whilst the imports of this product to Germany were only about 25,000 tons per annum. When all these facts are taken into account it will be seen that the British market for oil-seeds and their products is at least as large as that of Germany.

The differences between the trade of the two countries in 1912 and 1913 were all in favour of Germany, and enabled that country to select the richest oil-seeds for treatment, to avoid the importation of large quantities of the partly or wholly manufactured articles such as oils and margarine, and to secure a predominant position in the transit and export trade.

So far as India's share of the trade in the three chief importing countries is concerned, the detailed table shows that as regards quantity the United Kingdom was the chief importer, followed by France and Germany, whilst as regards value of imports France came first, followed by Germany and the United Kingdom.

In view of the somewhat special position occupied by Germany in the oil-seed-crushing industry immediately

before the war, it becomes of interest to ascertain the relative progress of the three European countries chiefly engaged in this industry in recent years. The details necessary for this purpose are summarised in Table V, which gives the position in each country in the years 1895, 1903, and 1913 (1912 for Germany).

It is clear from this summary that Germany made remarkable progress in recent years both in securing transit and re-export trade and in the crushing of oil-seeds. The German imports of oil-seeds increased in quantity from nearly 600,000 metric tons in 1895 to nearly 1½ millions in 1912, and in value from 5¼ to 23½ millions sterling in the same period.

The British industry, on the contrary, though beginning in 1895 at a higher level than the German and showing considerable progress, has not increased to the same extent. The quantity of oil-seeds imported rose from nearly 900,000 to 1½ million tons, and the value from over 6 millions to nearly 16 millions sterling during 1895 to 1913.

The evidence placed before the Committee shows that in buying oil-seeds in the markets of the world British oil-seed crushers were faced with severe competition from Germany, that country being able to pay better prices and therefore to exercise a choice in purchase.

Perhaps the best example of the practical effect of this competition is seen in the case of Egyptian cotton seed, of which, according to the Egyptian Trade Returns, no less than 94·4 per cent. was exported to the United Kingdom and only 0·08 per cent. to Germany in 1905. In 1910 the exports to the United Kingdom had sunk to 66·0 per cent. and in 1913 to 51·6 per cent., whilst those to Germany had risen to 29 and 45 per cent. respectively. The imports to the United Kingdom from Germany of undecorticated cotton-seed cake, made from Egyptian cotton-seed, rose from 3 tons in 1900 to 23,435 tons in 1910 and 71,040 tons in 1913. There was little or no demand for this cake in Germany, and it had to be exported to the United Kingdom. The Germans were able therefore in the course of a few years to secure nearly half of the important Egyptian cotton-seed trade at the

expense of this country, and to invade the British market with cake made from this seed. An interesting feature of this transfer of trade is that it seems to indicate the beginning of a movement to secure the German home market for oil-cakes, which even in 1912 was largely supplied by imports (over 800,000 metric tons). If so, British crushers may be faced in future with severe competition from Germany for the types of oil-seeds which they have hitherto specialised in crushing, and which give large yields of oil-cake.

A less important but still valuable item is the transit and export trade in oil-seeds. Neither Germany nor the United Kingdom produced oil-seeds in quantity before the war, and consequently the figures for transit and export trade in oil-seeds in the two countries may fairly be taken to represent each country's share of international trade in oil-seeds. While the British share of this trade has declined from 76,233 tons in 1895 to 47,233 tons in 1913, that of Germany has risen from 71,043 tons in 1895 to 253,167 tons in 1912.

An interesting feature of this trade in oil-seeds in both countries is that whilst exports have declined, transit trade has increased. The difference between these two branches of trade is that the exports consist of material landed and usually sold in the country of immediate destination, whilst transit trade is conducted mostly on through bills of lading.

It is clear from the details given in Table IV and the evidence submitted to the Committee that the rapid growth of German transit trade in oil-seeds is largely due to the development of this trade to Austria-Hungary and between Hamburg and Russian and other Baltic ports.

Condition of the German Industry

In view of the steady progress of all branches of the oil-seed and oil trade and industry in Germany, the Committee have given special attention to German conditions, in so far as they affect the demand for Indian oil-seeds.

The Committee have not been able to ascertain that the Germans had any advantage in buying oil-seeds in India, the same shippers being the channels of trade both to this country and to Germany. Similarly they seem to have had no apparent advantage in lower freights, though their disadvantage of slightly greater distance from India was offset by the fact that freight rates from Indian ports were practically the same to German as to British ports. This equality of freights increased Hamburg's natural advantage of situation in competing for transit and re-export trade in oil-seeds to Russian and other Baltic ports.

The real advantages of the Germans began when the oil-seeds reached their home ports, and may be discussed under the following heads :

1. *Port, Transit, and Railway Charges*

Most of the German imports of oil-seeds were received through Hamburg and were worked up at Harburg, a suburb of the former port. The German mills are nearly all on the water-side, so that costs of discharge were reduced to a minimum, and were on the whole below the charges made in British ports. The question of the relative amounts of port charges on oil-seeds at British and Continental ports was fully investigated by the Committee on Edible and Oil-producing Nuts and Seeds of West Africa in 1915, and the information obtained by that Committee is summarised in the following table :

Total Port Charges on a Ton of Palm Kernels

	s.	d.
Delivered to mills at Liverpool	5	6
[1]In transit at Liverpool	3	10
Delivered to mills alongside water at Hull	2	0
Delivered to mills not alongside water at Hull	4	6
[1]In transit at Hull	0	11
Delivered to mills alongside water at Bristol	1	11
Delivered to mills not alongside water at Bristol	2	8
[1]In transit at Bristol	1	11
Delivered to mills at London	3	5
[1]In transit at London	1	8
Delivered to mills at Hamburg	2	0
[1]In transit at Hamburg	0	8

[1] *Transit charges = port dues plus overside charges to craft or landing charges to quay.*

In view of the full investigation of this subject made by the Committee on West African Oil-seeds, this Committee have not sought to do more than make certain that the above figures are applicable to all classes of oil-seeds. The following figures, supplied by a firm exporting Indian oil-seeds and operating in each of the ports named, show that they may be accepted as generally correct :

London, in transit . .	1*s*. 9*d*. per ton.
Hull, in transit . .	1*s*. 0*d*. per ton.
Hamburg, in transit . .	1*s*. 0*d*. per ton ; 1*s*. 9*d*. per ton if landed on quay.

Bearing in mind the fact that imports of Indian oil-seeds to this country are chiefly crushed in Hull and London, it is clear that the British crusher at Hull was at no serious disadvantage as regards port charges in comparison with the crusher at Hamburg, the charges in the case of water-side mills being practically the same at Hamburg and Hull. Comparing London and Hamburg, the difference was about 1*s*. 5*d*. per ton in favour of Hamburg.

The question of port charges is more important in the case of transit and re-export trade in oil-seeds. In the United Kingdom practically the whole of this trade was done through London, where the port charges on oil-seeds in transit were from 1*s*. 8*d*. to 1*s*. 9*d*. per ton as against 8*d*. to 1*s*. at Hamburg, giving the latter port an advantage of from 9*d*. to 1*s*. per ton over London. This is a small amount, but it becomes important when added to the other disadvantages under which the British oil-seed broker laboured in competing for this trade.

Much of the European re-export and transit trade in oil-seeds was to Russian and Scandinavian ports. Hamburg, being nearer to most of these ports, naturally secured, and will continue to secure, the bulk of this trade unless special steps are taken to prevent it.

London brokers with great experience in this trade state that the difference in the cost of re-export of oil-seeds from London to Libau and similar ports and from Hamburg to the same ports was often four shillings per ton, due to a small extent to higher port charges, but mostly

to the cost of transport from London across the North Sea. In view of this handicap, which is largely the result of the geographical situation of Hamburg, it is not surprising that the German transit trade in oil-seeds developed much more rapidly than the British.

Similarly, the British oil-seed crusher was considerably affected by transport charges on oils and cakes to Baltic ports. He paid for his raw material practically the same price as his German competitor, but in exporting produce he had to pay, in addition, the cost of transport of oil and cake across the North Sea.

It is possible also that the large transit trade in oil-seeds from Germany to Austria-Hungary was facilitated by the fact that freight charges from India to Mediterranean ports were much higher than to Northern European ports.

2. *Assistance from German Trading Banks*

The German importer of oil-seeds was greatly assisted by the facilities granted by the German banks for financing cargoes, by means of which he was able, for a relatively small charge by the bank, to arrange credit for buyers for periods up to six months. Such long credits were specially advantageous when cargoes were sold to Russia.

Special efforts were made by London oil-seed brokers to meet this competition, but they were unable to get concessions in port charges, cost of transport, or better financial conditions for giving credit; and so the trade was gradually transferred from London to Hamburg. In this connection it may be pointed out that the German port authorities, banks, and importers all worked together, and so long as the trade was secured to German ports they had no objection to British brokers taking a share in it, at any rate for the time being. The German trading banks were willing to, and in fact did, extend the same facilities to their clients, whether the transaction was carried on through British or German brokers, provided always that the trade was done *via* German ports. Another important factor in the transfer of the trade in oil-seeds to Hamburg was the action taken by certain shippers

in India in appointing special agents in Hamburg and other Continental ports to sell oil-seeds for them without the intervention of British brokers. The increase of direct trade between India and the countries consuming Indian oil-seeds is of first importance to the cultivator in India, but the interests of trade within the Empire must not be lost sight of, and these interests demand that where indirect trade must take place, the intermediary should be British rather than foreign, provided that this does not involve any disadvantage to the Indian producer.

The advantages which Germany secured from the operations of her great trading banks were not confined to financial assistance to brokers and buyers in dealing with cargoes of oil-seeds. It is well known that the banks frequently came to the assistance of German manufacturers who desired to re-equip or extend their works; the usual procedure being for the bank to take up a certain amount of capital in the concern and to nominate a director to take care of the bank's interests. One at least of the most flourishing German oil-seed-crushing concerns was assisted by one of the German trading banks in this way. Such action was not confined to oil-seed mills in Germany itself, but was also extended to oil-seed mills in foreign countries, especially Russia, which accounts, to some extent, for the large share Germany secured before the war in the transit trade in oil-seeds to Libau and other Russian ports.

3. *Government Assistance to the Industry in Germany*

Government assistance to the oil-seed-crushing industry in Germany, apart from indirect help for scientific and technical education and research, etc., and possibly in cheap internal transport by rail and canal, consisted chiefly in the imposition of heavy import duties on imported oils and fats. According to Appendix C to the Report of the Committee on Edible and Oil-producing Nuts and Seeds (Cd. 8247), the German import tariff on oils and fats was as follows:

Seed Oils in Casks

	Per cwt. s.	d.
Colza and rape-seed oils	6	0
Linseed oil	2	0
Beech-nut, ground-nut, poppy-seed, niger-seed, sesame, and sunflower oils	5	0
Olive oil, pure	Free	
Cotton-seed oil	6	3
Castor oil, Cotton-seed oil, Sesame oil } officially denatured	1	0
Wood oil (tung oil)	2	0
Castor oil	1	0
Fatty oils, not specially mentioned	4	6
Fatty oils, not specially mentioned, officially denatured	2	0

Seed Oils in Receptacles other than Casks

	s.	d.
Olive oil, pure	5	0
Cotton-seed, beech-nut, ground-nut, poppy-seed, and other oils not specially enumerated, including castor oil not specified below	10	0
Castor oil, in tins, weighing with the tin at least 15 kilograms	1	0
Cocoa butter	17	6
Cotton stearin	6	3
Cotton stearin for the manufacture of soap, etc., and officially denatured	2	6
Palm oil, palm-kernel oil, coconut oil, and other vegetable fats when unfit for consumption	1	0
Margarine	10	0

Untreated oil-seeds and oil-seed cakes were admitted free.

4. *Other Advantages of the German Industry*

Certain of the witnesses stated that the German oil-seed crushers were able to carry on their operations more cheaply than their British competitors. On this point representatives of the British oil-seed crushers stated that there was not much to choose between British and German labour as regards efficiency and cost, and that, comparing equally modern works in Germany and this country, the difference in cost of operating was negligible. Unfortunately, however, most of the British mills are not large and modern in type; so that on the whole the German industry was undoubtedly conducted more cheaply

and efficiently than the British, mainly because it was of more modern growth, and for the reasons stated above was in a better financial position to replace plant that was no longer efficient.

To sum up, the German oil-seed brokers were able to secure a large share of the transit and re-export trade in oil-seeds, especially to Russian ports, mainly because of the favourable situation of Hamburg for this trade. Cargoes were delivered at Hamburg for practically the same freight charges as to London, and the German brokers thus saved the cost of transport across the North Sea. They had also the advantage of low port charges at Hamburg and of assistance from the German trading banks, which enabled them to arrange long credits for clients who desired such facilities.

These advantages were also, directly or indirectly, secured by the German oil-seed crushers. In addition, German crushers were readily assisted by the German trading banks to extend or re-equip their mills; but their most substantial advantage lay in their large and heavily protected home market. With duties ranging from £1 to £6 5*s*. per ton on imported oils, and £10 on margarine, they had an ample margin from which to (1) pay higher prices than their unprotected British competitors for the oil-seeds they desired to work and thus exercise the selective power over raw material which is all-important in modern industry; (2) undersell their competitors manufacturing in unprotected countries; (3) undertake scientific and technical research into the improvement of processes of milling and refining oils; (4) continually modernise their plant and equipment; and (5) give their shareholders a substantial return on their capital.

It is pointed out later in this Report that Germany was the most important market in the world for rape seed, the German imports of this seed in 1912 being over 131,000 tons. The duty of 6*s*. per cwt. on rape-seed oil meant in practice that the German rape-seed crushers were able to take, as a result of the protection of their home market, an additional profit of about £6 for every ton of rape-seed oil they produced, and the total sum so secured must have been at least £200,000. With a financial margin

of this order at their disposal, it is not surprising that the German rape-seed crushers dominated the market.

Condition of the French Industry

The witnesses who gave evidence before the Committee were on the whole less acquainted with the conditions in France than with those in Germany. Their general impression was that conditions in France were much more akin to those in the United Kingdom, there being apparently no concerted action on the part of the port authorities, bankers, merchants, etc., to secure trade, which is so characteristic of Germany.

The salient features of the French trade during the last 19 years are summarised in Table Vc.

French imports of oil-seeds rose from nearly 700,000 in 1895 to 1,100,000 metric tons in 1913; imports from India increased from 318,000 to 408,000 metric tons. The increase in oil-seed imports is therefore similar to that of the United Kingdom, and there is no evidence of a phenomenal development such as has taken place in Germany. Imports of oils have on the whole declined, whilst exports of oils have increased only to a small extent. The imports of oil-cakes have increased, on the whole, but only from 75,000 to 102,000 metric tons, whilst the exports of cake have nearly doubled. A notable feature of the French trade is the steady increase in re-exports of oil seeds, as shown by the difference between "general" and "special" exports. France grows some oil-seeds, so that in this case the special exports may represent some home-produced material. There has also been a regular increase in re-exports of oils.

Heavy import duties are levied on oils in France, except when they are derived from the French colonies (p. 18), and direct importation of oil-seeds from the country of origin is encouraged by a "surtaxe d'entrepôt," which is effective in preventing European countries from doing re-export or transit trade with France in oil-seeds.

According to Appendix C to the Report of the Committee on Edible and Oil-producing Nuts and Seeds

(Cd. 8247), the French tariff on oil-seeds, fats, and oil-cakes is as follows:

	Per cwt. s.	d.
Linseed oil	2	5¼
Cotton-seed, sesame, and ground-nut oils, intended for the manufacture of soap or alimentary fats (under certain conditions)	2	5¼
Other cotton-seed, ground-nut, and sesame oils	4	10½
Rape-seed, soya and maize oils	6	1½
Soya and maize oils, intended for themanufacture of soap (under certain conditions)	2	5¼
Olive oil, intended for the manufacture of soap (under certain conditions)	1	2¾
Other olive oil	4	0¾
Palm, coconut, touloucouna, illipe, and palm-kernel oils	0	4¾
Castor and pulghera oils	2	0½
Fixed oils, pure, not specially mentioned	6	1½
Margarine and alimentary vegetable fats	10	2
	Per ton. s.	d.
Oil-cakes containing less than 12 per cent. of oil	Free	
Oil-cakes containing from 12 to 16 per cent. of oil	6	1½
Oil-cakes containing more than 16 per cent. of oil	12	2½

The principal oil-seeds imported into France (ground-nuts, sesame, copra) are admitted free; the exceptions are subject to duties as follows:

European colza	1*s.* 9½*d.* per cwt.
Rape seed	1*s.* 9½*d.* per cwt.
Poppy seed	1*s.* 9½*d.* per cwt.
Niger seed	11½*d.* per cwt.
Soya beans	11½*d.* per cwt.
Cotton seed, decorticated	11½*d.* per cwt.
Camelina	9½*d.* per cwt.
Ravison	9½*d.* per cwt.
Beech nut	9½*d.* per cwt.

In addition there is a surtaxe d'entrepôt on non-European products imported from European countries as follows: Fruits and seeds, 6 francs per 100 kilos (2*s.* 5*d.* per cwt.).

Oil-seeds, oils, and cakes imported direct from most French colonies are admitted duty free, but exception is made in the case of these products from the French colonies in West Africa, Somali Coast, India, and Oceania, on which duties are charged according to the minimum tariff, except as regards palm, palm-kernel, illipé, and

touloucouna oils imported from French West Africa, which are admitted duty free.

It will be seen that the heavily-protected home market for oils in France also gives French oil-seed crushers the opportunity of paying better prices for oil-seeds than their unprotected British competitors, and this no doubt accounts for the greater range and better classes of oil-seeds worked in France than in the United Kingdom.

On the whole it seems clear from a consideration of the French figures that the imposition of import duties alone on oil-seeds is not sufficient to bring about a great increase in trade and industry, such as has occurred in Germany during the last 20 years. This emphasises the importance of the co-ordination of effort on the part of the Government, transport companies, port authorities, banks, merchants, brokers, and oil-seed crushers to secure trade, which is such a marked feature of the German system. Such co-operation is essential to secure the full benefit of a protected home market.

United Kingdom

Table VA, summarising the British trade, presents a marked contrast to that relating to German trade.

Beginning with a higher level of imports of oil-seeds than either France or Germany in 1895, viz. 886,000 tons, the United Kingdom only reached a level of 1,505,000 tons in 1913, an increase of about 70 per cent., as against 50 per cent. in the case of France and 154 per cent. in the case of Germany. Imports from India rose by 226 per cent., viz. from nearly 129,000 to nearly 422,000 tons. In the same period the re-export trade in oil-seeds fell steadily from 76,233 tons to 47,233 tons, a decline of 38 per cent., whilst the transit trade increased from 7,602 in 1903 to 21,391 tons in 1913.

The German transit trade in oil-seeds rose in the period 1895–1912 from 21,955 to 209,270 metric tons, an increase of over 850 per cent. The most striking feature of the British imports of oil-seeds before the war was the smaller range of oil-seeds imported as compared with France and Germany. This feature of the trade

has altered considerably to the advantage of this country since the war.

The British imports of oils increased from 134,000 tons to 207,000 tons, and those of cakes from 313,700 tons to 406,700 tons, or 54 per cent. and 30 per cent. respectively. The British re-export and transit trade in oils remained practically unaltered throughout the period.

Condition of the Trade and Industry in the United Kingdom

The evidence given by nearly all the witnesses, whether shippers, brokers, or oil-seed crushers, gave the impression that the condition of the oil-seed trade and industry in the United Kingdom before the war may be briefly described as that of severe competition, not always successful, with Continental and especially German oil-seed crushers. The principal disadvantages under which the trade and industry laboured are discussed in detail in the following paragraphs.

Port, Transport, and Railway Charges

It has already been pointed out that London, which is virtually the only British port at which re-export and transit trade in oil-seeds is carried on, is at a serious disadvantage in competing with Hamburg for this trade owing to its higher port charges, which made a difference of 9*d*. to 1*s*. per ton of oil-seeds in favour of Hamburg. London was at a further disadvantage, owing to the fact that freights from Indian ports were practically identical to London and to Hamburg, so that British brokers competing for trade to Russian and Scandinavian ports had not only to pay higher port charges than their German competitors, but had, in addition, to meet the cost of transport across the North Sea. It is estimated that these two items alone made a difference of 4*s*. per ton of oil-seeds in favour of the Hamburg brokers.

The British oil-seed crushers did not suffer to the same extent from high port charges because most of the mills are at Hull, which is as cheap a port as Hamburg. They were, however, handicapped in the export of oils and cakes to Russian and Scandinavian ports, because

they had to pay the same price for their raw material as the German oil-seed crushers, and, in addition, the cost of transporting the products—oils and oil-cakes—across the North Sea. At the same time the British oil-seed crushers had to stand severe direct competition in their home market from oils and oil-cakes produced on the Continent, and their home market was further limited by heavy imports of margarine from the Continent and especially from Holland. The primary factor in this competition was the protection given to the Continental crushers in their home market, which will be referred to later, but a secondary factor of great importance was cheap transport on the Continent, and from the Continent to British east-coast ports.

In recent years it has been possible for German oil-seed crushers to deliver cotton-seed cakes at certain British towns cheaper than they could be delivered from Hull. The following are typical examples of transport rates which bear out this statement :—

The German oil-cakes were usually carried in small sailing-vessels of 150 to 250 tons capacity, and the rates of freight charged from the Continent to certain east-coast towns in Scotland are compared in the following table with the cost of transport to the same towns from Hull and Leith.

Sailing-vessel freight rate from Continent. Winter. s. d.	Summer. s. d.	Destination.	Cost of transport from: Hull. s. d.	Leith. s. d.
10 0 to 12 6	6 0 to 8 0	Aberdeen, Inverness, Wick, Invergordon	10 0 (sea)	—
		Berwick	7 6 (sea)	7 9 (rail)
		Dundee	10 0 (sea)	—
		Perth	12 6 (sea and rail)	

The freight rate from Hamburg to King's Lynn, one of the principal ports favoured by these small German sailing-vessels carrying oil-cakes, has been as low as 4*s.* 9*d.* per ton, but was usually 5*s.* to 6*s.*, which made it possible to deliver German-made cakes at an agricultural centre, such as Bedford, at an average of 6*d.* per ton less than British-made cakes could be delivered from Hull.

It is clear from this table that these low freight charges

from German and Dutch ports to British towns on or near the east coast gave the Continental crushers no inconsiderable advantage in competing in the British market, and contributed to the success of the Germans in securing such a large share of the Egyptian cotton-seed trade to which reference has been made already, since they had to find a market for the surplus cotton-seed cake in this country, at any rate at first.

It has also been represented to the Committee that oil-seed crushers, in common with other British industries, are handicapped by high railway rates. This hardly affects the export trade directly, as most of the mills are situated on the water side, but it affects to some extent the export trade in products made from oil-seeds.

It has been further pointed out that the cost of transport of oils on British railways can be materially reduced by the use of tank wagons ; thus it is stated that the difference in the cost of sending a ton of oil from Hull to Manchester is about 8*s*., when transport is effected in tank wagons instead of in casks or drums. It is now clearly established that such wagons are quite suitable for the transport of industrial and unrefined oils, and it is desirable that the railway authorities should provide enough tank wagons to make this the usual mode of transport of such oils.

Financial Assistance from Banks

On pp. 13–14 mention is made of the assistance afforded by the German trading banks, both in facilitating long credits and in providing capital for mills.

In the United Kingdom such assistance is readily obtainable from banks, but not to the same extent. In this country the financing of cargoes and the giving of credit are largely done by the broker, with or without the assistance of his bank. Some of the brokers appear to have large resources, but the financial burdens they can carry must always be less than can be undertaken by large trading banks. Some of the largest oil-seed crushers import oil-seeds direct and pay cash against documents. Others buy through brokers, and either pay on delivery or get short credit—14 days to a month,

as a rule. It has been suggested to the Committee that it would sometimes be an advantage to British oil-seed-crushers to be able, with a bank's assistance, to purchase large stocks of oil-seeds on long credits. Crushers, however, generally appear to be of opinion that in normal times such action is rarely necessary, as purchases for future delivery can nearly always be arranged without difficulty, and they appear, on the whole, to be satisfied with the present system.

The case is different in the transit and re-export branches of the trade. The process has already been explained (p. 12) by which the transit and re-export trade in oil-seeds, especially to the Baltic ports, has been largely diverted from London to Hamburg by the accumulated pressure on the British broker of heavier port charges, cost of transport across the North Sea, and less adequate facilities for arranging long credits to foreign buyers than are available to his German competitors. The importance of adequate financial backing in connection with the transit and re-export trade in Indian produce has been strongly impressed on the Committee, and is also insisted on by Messrs. Chadwick and Black in their recent Report on Indo-Russian Trade. Similar difficulties are also met with by the British oil-seed crusher exporting oils and oil-cakes to Continental countries, such as Russia, where long credits are expected by buyers.

Reference has also been made on p. 14 to the advantage the German oil-seed crusher had in being able to enlist the assistance of trading banks in providing capital for equipment and extension or modernisation of works. In Germany, where the provision of new capital had become more and more a matter for the trading banks, it was probably easier to get capital for some industries than in the United Kingdom, where, when large amounts are required, an appeal to the investing public is generally necessary. It was, however, strongly impressed on the Committee that the question of the provision of capital for the modernisation and extension of British oil-seed-crushing mills would solve itself if the industry as a whole were able to show a higher margin of profit than was the case before the war, when competition with crushers in protected

Continental countries was carried on under conditions highly disadvantageous to the British crusher.

Allowance for Depreciation of Plant

Another point of great importance which has been brought to the notice of the Committee is the low allowance on income tax usually made for depreciation of plant in this country, viz. from 5 to 7½ per cent. on plant and nothing on buildings, as against 10 per cent. on plant and 2½ per cent. on buildings in some Continental countries. One witness stated that in his mill the whole of the machinery had to be renewed in the course of four years, and the British allowance for depreciation of plant is clearly inadequate for such a case. Any arrangement which fails to make adequate allowance for such renewals is clearly against the best interests of British industry, since it actually penalises the most enterprising firms.

Recent Development of the British Industry

In spite of the difficulties referred to above, British oil-seed crushers have largely adapted their machinery for the treatment of new and especially richer types of oil-seeds, and progress in this direction has been especially marked since the war, in spite of the difficulties of obtaining plant and securing labour. A number of new mills are being installed or are projected, and there is little doubt that, if the conditions of the industry are made more favourable than before the war, this process of modernisation and extension will go on. The general impression conveyed by the evidence is that up to 1913 the oil-seed-crushing industry in this country had passed through exceptionally difficult times. These have not seriously affected the newer, larger mills with adequate capital behind them, but have greatly handicapped some of the smaller mills and prevented them from being modernised. The disappearance of German competition with the outbreak of war, and such episodes as the recovery of the palm-kernel industry by mills in this country, have completely altered the outlook. The Committee are

satisfied that all that is necessary for development in the future is some kind of guarantee that the pre-war conditions, which made competition with the Continental mills extremely difficult, and often impossible, will not be renewed.

Possible Increased Demand for Indian Oil-seeds in the United Kingdom

Of the ten chief Indian oil-seeds considered in this Report, seven form possible raw material for the manufacture of margarine and other edible fats and oils. These are copra, mowra, ground-nuts, cotton seed, sesame seed, linseed, and rape seed. Linseed, poppy seed, and niger seed yield drying oils suitable for use chiefly in the manufacture of paints and varnishes, whilst castor seed is in a class by itself, furnishing oil used chiefly for lubricants, especially for aeroplanes, and to a small extent for medicinal and other purposes.

The possibility of an increased demand for Indian oil-seeds depends, therefore, mainly on the chance of a large margarine and edible-fat industry being established in this country.

The British imports of margarine, chiefly from Holland and Denmark, during the five years 1912–16 have been as follows:

1912. (*Tons.*)	1913. (*Tons.*)	1914. (*Tons.*)	1915. (*Tons.*)	1916. (*Tons.*)	1917. (*Tons.*)
67,621	75,914	76,461	102,609	137,643	not published.

The Committee have reason to believe that the total consumption of margarine in this country towards the end of 1917 was about 5,500 to 6,000 tons per week, of which 2,000 to 2,500 tons were imported. It is well known that the use of margarine has increased since the war, and is still rapidly increasing owing to the scarcity of butter. It seems reasonable to suppose that, after the war, though there may be some reversion to the use of butter, the quantity of margarine is not likely to show any considerable decline. Indeed, competent authorities believe that consumption will still increase, and that the new margarine factories now being erected in this country

will meet the whole of the British requirements. It is clear that if the British market for margarine can be secured by home manufacturers, an immense new British market for oil-seeds and oils of Indian production will be opened up. In this connection it is also of interest to note that more than one project for the manufacture of margarine in India is now under discussion. It is therefore most important that India should be in a position to meet this prospective British and Indian demand for oil-seeds yielding oils suitable for edible purposes.

Copra.—The world's exported surplus of copra in 1913 was probably about 537,000 tons, of which the British Empire exported about 157,000 tons. India alone exported 38,000 tons. The most important source of copra was the Netherlands East Indies, which exported nearly half the world's supply. Details of the world's exports for 1913, so far as they can be ascertained, are given in Table VI annexed. To these exports of copra must be added about 38,000 tons of coconut oil exported in 1913 from Ceylon, India, Philippines, and Australia, equivalent to about 58,500 tons of copra. Since the outbreak of war the world's exported surplus of copra has diminished, whilst that of coconut oil has increased. In 1913 this total exported surplus of copra and oil, *expressed in terms of coconut oil,* was probably about 380,000 tons, the bulk of which was distributed as follows :

	Tons.[1]	
Australia	2,544	
United States	22,657	
Belgium	8,546	
United Kingdom	47,900	
Russia	44,497	
France	69,034	
Total to Allied Countries		195,178
Holland	7,154	
Total to Neutral Countries		7,154
Germany	108,385	
Austria-Hungary	23,696	
Total to Enemy Countries		132,081
Grand total		334,413

[1] *In all cases these are quantities of copra and coconut oil, reckoned as oil,* retained for consumption, *as calculated from the Trade Returns of the various countries.*

It is clear from this statement that the United Kingdom alone could have taken in 1913 for its own use the whole of the copra and coconut oil exported from India, whilst the Allied Countries together could have absorbed the copra and coconut oil annually produced in the British Empire, which might then be estimated as equal to about 140,000 tons of coconut oil. Since then the requirements of the United Kingdom and of certain of the Allied countries for copra and coconut oil have increased. There are, however, difficulties about securing these markets for Indian copra which are not apparent from the simple statistical statement. The copra produced in India and Ceylon, the chief producers in the British Empire, is of first-rate quality. Before the war the United Kingdom and France preferred to express copra of inferior quality, such as that from Zanzibar and the Pacific Islands, which could be purchased at lower prices than Ceylon and Indian copra. Both British and French refiners state that from this inferior copra they can produce refined coconut oil equal in quality to that obtained in Germany from Ceylon and Indian copra, but since the war both the United Kingdom and France have taken more Indian copra. The Committee are assured that the new British mills, which will work copra for oil for edible purposes, will prefer to use Malabar and Ceylon copra, but in view of the fact that equally good refined oil can be produced from inferior kinds of copra, it is clear that this preference will only be shown as long as the price of Indian and Ceylon copra is not forced up to abnormally high levels, in comparison with the prices of other kinds.

It should also be noted that since the war West African palm kernels have been crushed on a large scale in this country, and that the preferential export duty to be levied in British West Africa on palm kernels exported to foreign countries and crushed there may permanently divert this industry to the United Kingdom. Palm-kernel oil for practical purposes can be regarded as identical with coconut oil. These two sources of supply of this type of oil were together more than enough to meet the pre-war needs of the Allied countries, but owing to the great increase in the demand for this type of oil for the manu-

facture of margarine since the war began, it is no longer certain that this is the case. In this connection it should be noted that the United States has begun to import palm kernels and has increased its imports of copra and coconut oil.

Ground-Nuts.—The world's exported surplus of ground-nuts is probably about 780,000 tons per annum, of which the British Empire contributes about 55 per cent. from India, Gambia, Nigeria, Nyasaland, and the Sudan, British India alone exporting about 45 per cent., viz. about 380,000 tons. It is not generally realised that British India makes so large a contribution as this to the world's supplies of ground-nuts. This is due to the fact that nearly one-third of British India's exports are shipped from French-Indian ports, and therefore do not appear in the British Indian Trade Returns. French West Africa exports another 30 per cent., China about 8 per cent., and the Dutch East Indies and Portuguese East Africa together about 4 per cent.

Before the war France alone used nearly 70 per cent. of the world's exported surplus of ground-nuts, and Germany about 14 per cent.

In addition to this quantity of ground-nuts which appears in international trade, there is a considerable production of ground-nuts in Spain, the United States, and elsewhere for direct use as food. The cultivation of ground-nuts has been taken up in Burma in recent years, and the nuts are crushed there, the oil being sold locally and the cake exported chiefly to the United Kingdom. Rhodesia has also begun to grow and crush ground-nuts, both the oil and cake being used locally. Ground-nut cultivation has also been started in other countries, such as Nyasaland, and it seems certain that there will be a large increase in the production of ground-nuts throughout the tropics, since the plant is easy to grow, gives a valuable product, and at the same time, like all leguminous plants, enriches the soil. It is most important, therefore, that the crushing of ground-nuts should be taken up on a large scale in the Empire. Since the war a number of British mills have begun to crush ground-nuts, and in 1917, 137,758 tons were imported into this country, the

re-exports during this period amounting to only 1,370 tons. The Committee are assured that British margarine makers are likely to use increased quantities of ground-nut oil, and that for their purpose larger quantities of ground-nuts of the best quality will be required. Unfortunately, the bulk of the ground-nuts shipped from India are not of good quality. This is due to the fact that they are shelled by the primitive process of wetting the nuts, allowing the wet shells to soften by fermentation, or in other words to rot, and then extracting the kernels. As a result of this crude process most of the Coromandel ground-nut kernels reach Europe in such a state that the oil obtained from them is usually only fit for industrial purposes. Considerable progress has been made in the introduction of machinery for shelling the nuts, and the Committee feel that it is of vital importance that steps should be taken by the Government of India to encourage in every possible way the extension of this process, in order that Coromandel kernels may secure a better position on the Marseilles and other markets, as a raw material for the production of edible ground-nut oil. It is most desirable also that exporters of ground-nuts from India should realise that the increasing manufacture of margarine in the United Kingdom means that there is a large prospective market in this country for ground-nuts, and that to meet the requirements of this market it will be necessary to produce ground-nuts equal in quality to those obtainable in British and French West Africa. Margarine makers have hitherto preferred to use ground-nuts in the shell, in order to avoid any risk of deterioration during transit. At present they give preference to ground-nuts from Gambia, Nigeria, and China, the two latter types being usually shelled. It is not yet certain that it is necessary to import ground-nuts in the shell in order to prepare from them the best quality of edible oil, and this question is now under investigation in France, where the opinion of crushers is divided on the subject.

For the reasons given above it is not easy to estimate to what extent British crushers' requirements of ground-nuts are likely to increase in the near future. The increase will undoubtedly be considerable, but there is little

prospect of India sharing in this trade until the quality of her output of ground-nuts is generally improved. There is no reason to suppose that the French market for Indian ground-nuts is likely to diminish when normal conditions are restored; and, in view of the comparatively small, though increasing, quantity of ground-nuts taken by Germany and Austria before the war, a market for all the ground-nuts at present produced in India and the rest of the Empire seems assured after the war, though it must not be forgotten that efforts are being made to meet French requirements to a greater extent than hitherto from the French colonies.

Sesame Seed.—The world's exports of sesame seed are difficult to estimate owing to the absence of complete export returns from Turkey. The total was, however, probably about 264,000 tons in 1913, made up as follows:

British Countries:	*Tons.*		*Tons.*
India	112,200	East Africa	3,800
Sudan	6,750	Uganda	900
	Total, 123,650 *tons.*		
Allied Countries:			
China	121,100	French West Africa	800
Manchuria	2,000	Portuguese East Africa	1,300
Indo-China	1,250		
	Total, 126,450 *tons.*		
Enemy Countries:			
"German" East Africa	1,850	Turkey	12,200
	Total, 14,050 *tons.*		
	Grand total, 264,150 *tons.*		

France and Germany were, before the war, the chief consuming countries. The United Kingdom expressed little or none before the war, the small quantities imported being used chiefly for direct incorporation in compound feeding-cakes. The demand for sesame seed on the Continent was largely artificial and due to the existence of regulations compelling its use in margarine, with a view to simplifying the detection of the latter when substituted for butter. So long as this special stimulus is in operation the price of sesame seed in relation to other seeds will remain high, and British makers of margarine, who will not be affected by these regulations, unless they begin to export margarine to the Continental countries concerned, will not in such circumstances buy sesame seed. They

are, however, prepared to use it when, as is the case now, its price is on the same level as that of other oil-seeds yielding similar oil. Sesame oil is intrinsically one of the best oils for the manufacture of margarine, and this will always be a considerable inducement to margarine makers to use it.

Cotton Seed.—The world's production of cotton seed in 1913–14 probably amounted to about 11,000,000 tons, and the exported surplus to nearly 900,000 tons; these two amounts were made up as follows:

	Production. *Tons.*	Exported surplus. *Tons.*
United States	5,620,000	7,295
India	2,110,000	284,327
China	1,600,000	10,863
Egypt	620,000	428,136
Russia	440,000	17,770[1]
Other countries *including*:	600,000	—
Brazil	—	47,629[1]
Turkey	—	26,639[1]
Peru	—	12,745[1]
British African Colonies	—	19,701
British West Indian Colonies	—	1,292
Hayti and San Domingo	—	1,992[1]
Grand total	11,000,000 (approx.)	858,389

[1] *British imports only. No other figures available.*

The exported surplus of nearly 900,000 tons relates to seed alone; in addition, account must be taken of the exports of oil and cake from countries producing cotton seed. These were as follows in 1913:

	1913. Oil. *Tons.*	1913. Cake. *Tons.*
United States	145,000	357,131
Egypt	2,542	62,870
China	4,303	33,544[1]
Other countries, including:		
Russia	—	86,000[2]
India	10	10,429

[1] *Exports from Shanghai only. Complete figures not available.*
[2] *Exports to Germany and Denmark only. Complete figures not available.*

From the foregoing figures it appears that the exported surplus of cotton seed grown within the Empire and of

products made therefrom compares as follows with the United Kingdom annual requirements in the years 1910 to 1913:

	Tons.	United Kingdom.	Tons.
Exported surplus of cotton seed from British producing countries . .	733,000	Imports, seed .	633,145
Exported surplus of cotton-seed oil from British countries producing seed	2,600	Imports, oil .	21,952
Exported surplus of cotton-seed cake from British countries growing cotton seed	73,000	Imports, cake .	218,729

In view of these figures there can be no doubt of the capacity of the United Kingdom to take the whole of the cotton seed exported from India, even if it recovers its former position as practically the sole buyer of Egyptian seed.

Castor Seed.—India has a virtual monopoly of the world's trade in castor seed. Though small quantities have occasionally been exported from other countries and the plant can be grown practically anywhere in the tropics, there is at present no indication of India's monopoly being seriously threatened, though in recent years cultivation has been undertaken in Manchuria and about 35,000 cwt. of oil produced from this seed is now exported annually from Newchwang. The seed is also being grown in Java and Indo-China. The exports of castor seed from India amounted to nearly 135,000 tons in 1913–14, of which 56,000 tons were sent to the United Kingdom. The British Trade Returns for 1913 give the imports as 60,000 tons and the re-exports as 13,000 tons.

The exports of castor oil from India in 1913–14 amounted to 1,007,001 gallons (4,340 tons), which was practically all sent to other parts of the Empire, Australia, New Zealand, Straits Settlements, Mauritius, United Kingdom, Ceylon, and the Union of South Africa being the chief customers in the order given. The United Kingdom imported in 1913 nearly 325,000 gallons (1,400 tons) of castor oil, of which nearly 248,000 gallons (1,100 tons), equivalent to 2,700 tons of seed, came from foreign countries, chiefly Belgium, France, and Italy. The total

annual requirements of the United Kingdom for castor seed, allowing for the imports as oil, may be put at about 49,000 tons, or, including the re-export trade, at 62,000 tons. These requirements may be expected to increase owing to the growing demand for castor oil as a special lubricant. The other principal destinations of Indian castor seed before the war, according to the Indian Trade Returns in 1913–14, were: France (21,000 tons), Belgium (15,000 tons), Italy (12,000 tons), and the United States (20,000 tons). In that year, according to the same returns, Germany took an unusually large quantity, nearly 10,000 tons, and some may also have reached Germany from Belgium and the United Kingdom.

The exports of castor oil from the United Kingdom to Germany in 1913 amounted to over 1½ million gallons.

These figures show that exports of castor seed to Germany before the war were comparatively unimportant, and that the United Kingdom, in conjunction with the Allied countries, could probably take the whole of India's normal output. The export of castor oil from Newchwang is becoming important; the destination of this oil is not available, but it probably goes largely to Japan.

Rape Seed.—The world's production and exported surplus of rape seed in 1913, so far as they can be ascertained, were as follows:

	Production.[1] *Metric tons.*	Exported surplus. *Tons.*
India	1,254,615	249,000 (1913–14)
Japan	108,882	—
Rumania	51,814	35,000[2]
France	32,133	4,160
Austria	13,832	—
Hungary (1911)	28,059	40 (average)
Bulgaria (1912)	14,657	—
Netherlands	3,064	—
Belgium	1,595	—
Russia	—	59,020
China	—	36,700[3]
Total		383,920

[1] *"Annuaire International de Statistique Agricole,* 1915 *et* 1916."
[2] *Estimated.*
[3] *By* 1915 *this had risen to* 64,978 *tons; it goes chiefly to Japan.*

The chief exporting countries are India, Russia, Rumania, and China, and the world's exported surplus

from these areas may be taken as about 380,000 tons in 1913, of which India contributed nearly 65 per cent. In addition, mention must be made of the oil obtained in various countries from home-grown seed, though the amount cannot be estimated.

The principal countries exporting rape-seed oil and the amounts exported in recent years before the war are as follows :

	1911. *Gallons.*	1912. *Gallons.*	1913. *Gallons.*
United Kingdom	1,507,815	1,331,397	1,418,877
Germany	1,371,382	540,857	989,460
France	561,650	387,658	418,087
Belgium	488,899	429,244	—
Japan	—	603,577	1,261,025
India [1]	377,824	377,563	406,890

[1] *Including a small amount of mustard oil.*

Of these six countries the last four grow seed, but India alone does not import seed. The Japanese exports of oil represent in part oil prepared from Chinese rape seed, a new and increasing trade, which bids fair to be a serious competitor with that of India. France and Belgium both grow and import rape seed, and it is not possible to say whether their exports of oil are from home-grown or from imported seed.

The chief importing countries for rape seed in 1913 and their sources of supply in recent years are shown in the following table :

	Total imports. *Metric tons.*	Nett imports. *Metric tons.*	Imports from India. *Metric tons.*	Other sources of supply.
Germany	153,427 [2]	148,454	118,175	Rumania and Russia.
France	55,360 [3]	51,196	48,211	China and Rumania.
United Kingdom [1]	49,178	48,877	17,869	China and Russia.
Holland	47,909 [2]	28,667	4,313	—
Belgium	97,023 [2]	37,294	67,308	Russia and Rumania.
Sweden (Gothenburg)	11,036 [4]	—	not stated	—
Italy	10,182	—	do.	—
United States [1]	2,665 [3]	2,665	do.	—

[1] *Long tons.* [3] *General trade.*
[2] *Special trade.* [4] *Linseed and rape* (1912 *figures*).

This table shows that Germany was, before the war, the principal market for rape seed, taking nearly 40 per cent. of the world's exported surplus. In the period 1910–13 Germany imported annually on the average 150,000 tons of rape seed, and exported about 7,000 tons,

leaving 143,000 tons to be worked up in the country. It is believed that before the war Germany and Holland together used in 1913 nearly 3,000 tons of rape-seed oil for the manufacture of margarine. As great improvements have been made recently in the refining of rape-seed oil, it is possible that this oil may be used in the future in considerable quantities in the United Kingdom for this purpose. The British requirements of rape seed before the war were on the average about 45,000 tons per annum. To this may be added 7,000 tons of rape-seed oil and 30,000 tons of cake, making in all about 82,000 tons of seed required to meet the pre-war requirements of the British home and export trade. In the future the United Kingdom may be able to take more, if rape-seed oil becomes securely established as an edible oil. In that event Indian trade would benefit, as Indian rape seed is of better quality than Russian and yields an oil easier to refine.

Linseed.—The world's production and exported surplus of linseed in 1913 were, according to the "Annuaire International de Statistique Agricole, 1915 et 1916," as far as known, as follows (small producers, such as Algeria, Spain, Bulgaria, Japan, Turkey, and Sweden, are omitted):

	Production. *Metric tons.*	Exported surplus. *Metric tons.*
Argentina	995,000	1,016,732
Russia [1]	703,490	108,939
India	547,243	373,022 [2]
Canada	445,508	582,931 [3]
United States	453,484	7,192
Uruguay	24,451	45,827
Rumania	13,445	In these cases imports exceed exports.
Austria-Hungary	15,453	
France	7,626	
Belgium	9,823	
Italy	10,300	
Netherlands	8,276	
China	Not available	10,059
Total		2,144,702

[1] *European and Asiatic Russia.*

[2] *The exported surplus from India for the five fiscal years* 1909–10 *to* 1913–14, *according to the Indian Trade Returns, has been as follows*:—233,859, 370,552, 522,023, 354,490, *and* 413,874 *tons respectively.*

[3] *Canada's exports of linseed, according to the Report of the Canadian Department of Trade and Commerce, have fluctuated greatly, being as follows in the years* 1909–16:—17,344, 49,991, 67,402, 37,613, 253,092, 516,183, 192,238, *and* 48,613 *tons respectively.*

The export of linseed from Russia for the period 1909–13 averaged 136,566 metric tons per annum, whilst Argentina, now the chief producer, may be expected to export up to 1,000,000 tons.

For the five years 1909–13 the average world's exported surplus of linseed may be put at 1,400,000 tons annually, to which India contributed on the average nearly 27 per cent.

The "special" imports (nominally imports for use or consumption in the country) of linseed into the chief importing countries during recent years have shown considerable fluctuation, and were as follows, according to "Annuaire International de Statistique Agricole, 1915 et 1916":

Chief Linseed-importing Countries in Europe

Year.	United Kingdom. *Met. tons.*	France. *Met. tons.*	Belgium. *Met. tons.*	Germany. *Met. tons.*	Holland. *Met. tons.*
1909	311,726	161,500	266,505	436,867	247,267
1910	247,414	135,363	200,045	320,522	191,484
1911	248,096	105,328	227,556	276,343	171,166
1912	265,245	137,629	223,032	330,092	208,929
1913	612,342	237,406	259,104	560,428	286,035
1914	449,438	123,469	179,866[1]	328,628[1]	261,740
1915	413,709	33,582	—	—	340,728
1916	508,597	62,773	—	—	173,077

[1] *First six months only.*

The following table shows the relation which these imports bear to the world's exported surplus for the same years, as given in the publication already quoted:

Year.	World's exported surplus *Metric tons.*	Proportion per cent. of the world's exported surplus, represented by imports into: United Kingdom.	France.	Belgium.	Germany.	Holland.
1909	1,286,821	24·2	12·5	20·7	33·9	19·1
1910	1,197,060	20·6	11·3	16·6	26·7	15·9
1911	1,146,853	21·6	9·1	19·8	24·0	14·9
1912	1,266,743	20·9	10·8	17·6	26·5	17·2
1913	2,144,702	28·8	11·1	12·1	26·2	13·4

Of the special imports into Belgium more than half is re-exported to Germany. In the German Trade Returns these imports are not shown as coming from Belgium, but from the presumed country of origin.

Italy, Austria-Hungary, and Australia each imported about 40,000 tons per annum.

The following tables show the quantities and percentages of the imports of linseed into the United Kingdom, derived from the chief contributing countries :

Chief Sources of Imports of Linseed into the United Kingdom

(*a*) *Quantities*

	1912.	1913.	1914.	1915.	1916.
From:	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Russia	48,155	18,379	21,163	2,659	12,607
Argentina	71,825	208,679	190,299	235,951	169,180
India	118,377	126,472	205,265	147,329	280,438
Canada	1,801	236,606	20,995	145	323
Total	264,170	606,308	454,033	393,779	462,548

(*b*) *Percentages*

From:	1912.	1913.	1914.	1915.	1916.
Russia	18·2	3·0	4·7	0·7	2·7
Argentina	27·1	34·4	41·9	60·0	36·3
India	44·8	20·8	45·2	37·4	60·2
Canada	0·7	39·0	4·6	—	0·1
	90·8	97·2	96·4	98·1	99·3

In considering the requirements of the United Kingdom for linseed, account must also be taken of the relatively large imports of linseed oil and linseed cake. Taking the average of all these imports for the years 1911–15, it appears that about 460,000 tons of linseed were required to meet the demands of the home and export trade in these years.

The average exports of linseed from India for the years 1910–11 to 1914–15 have been about 397,000 tons. The United Kingdom could therefore take the whole of the Indian output of linseed without difficulty, without any extension of the present demand.

During the years 1911–15 the United Kingdom met its requirements of linseed from the following sources :

	Tons.
Average gross annual import	395,283
Average import from British sources	202,394
Average import from India	150,344
Average import from neutral countries	163,504
Average imports from Argentina	153,623
Average imports from allied countries	27,894
Average imports from Russia	24,858

The domination of the British market for linseed by India would therefore mean largely the replacement of

Argentina linseed. The British imports of raw linseed have, however, been as high as 606,000 tons in a recent year (1913), and if this high level could be maintained, owing to specially favourable circumstances, the United Kingdom might still take large quantities of Argentina linseed in addition to the whole of India's output. In this connection it is of interest to note that recently linseed oil has been refined for edible purposes in the United Kingdom. This may mean the opening up of a new outlet for the oil in this country.

Other Indian Oil-seeds.—The discussion on pp. 25–38 covers the oil-seeds which form the bulk of India's trade in oil-seeds, and there only remain for consideration the export of the less important seeds, mowra, poppy, mustard, and niger. The exports of all these are small; and, as indicated in Table III annexed, the United Kingdom does not, as a rule, take much of any of them, the chief consuming countries being Germany and France. These seeds all yield fats and oils, which could be utilised in the United Kingdom, and they have all been crushed here when conditions were specially favourable. There can be little doubt that, if the British oil-seed-crushing industry is placed in better circumstances than it was before the war, there will be a demand here for miscellaneous oil-seeds of this description. In this connection special mention may be made of mowra seeds, which yield a fat suitable for the manufacture of "chocolate fats," for which the demand in the United Kingdom is now growing steadily, and to the manufacture of which increased attention is being given.

General Conclusions

India's Position as a Source of Supply of Oil-seeds

The annual production of oil-seeds in India is worth about 50 millions sterling, and the exports of oil-seeds, oils, and cakes about 18 millions sterling. India is therefore one of the most important of the world's sources of supply of oil-seeds. Before the war Indian oil-seeds were imported chiefly by the United Kingdom (422,000 tons, valued at

£4,100,000, in 1913), Germany (291,000 tons, valued at £4,800,000, in 1912), and France (408,000 tons, valued at £5,878,000, in 1913). France's somewhat special position in the Indian trade was due to her large purchases of ground nuts, for which Marseilles was and still is the best market. From these figures it is clear that the United Kingdom took from India chiefly the cheaper seeds, comparatively poor in oil, whilst her two chief competitors, and especially Germany, purchased the more valuable seeds, rich in oil. This difference in the nature of India's trade in oil-seeds with the United Kingdom and Germany is the chief fact to be kept in mind in making suggestions for the increased usage of Indian oil-seeds in the United Kingdom and other parts of the Empire.

The Committee's enquiry has resolved itself into three main divisions: (1) the position of India in the world as a source of supply of oil-seeds; (2) the conditions which have made it possible for certain Continental countries, and especially Germany, to secure a predominant position in competing for the better classes of oil-seeds produced in India; and (3) the action required to enable the United Kingdom to secure in the future a larger supply of Indian oil-seeds, and more especially the better classes of these oil-seeds.

Even before the war the world's supplies of oil-seeds, especially in certain groups, were not keeping pace with the growing demand for oils and fats. This was due mainly to the rapidly increasing demand for edible fats, such as margarine, brought about partly by the decline in the supplies of butter and partly by the constantly rising demand for fats, due to gradual improvement in the standard of living in all countries. Since the outbreak of war the world's herds of cattle have declined greatly in numbers, resulting in a much diminished production of butter and animal fats, which has added still further to the demand for vegetable oils for the manufacture of butter substitutes. The Committee have reason to believe that the possible production of oil-seeds in the world at the present time is far short of the world's demands, and that, for some years after the war, the scarcity is likely to be acute. It is satisfactory therefore to learn

that, in spite of the difficulties which have been experienced in India in the shipment of oil-seeds since the war began, there has been no serious diminution in production, and that in some cases, *e.g.* ground-nuts, the Indian output has actually risen. It is desirable that India's pre-war rate of production of oil-seeds should be increased, if possible, to meet the growing requirements for oil and fat, not only of the Empire as a whole, but of India itself.

Quality of Indian Oil-seeds

With the exception of palm kernels and soya beans, India makes an important contribution to all the principal kinds of oil-seeds which form the basis of the world's oil-seed-crushing industry. The quality of the various kinds of oil-seeds produced in India has been compared in another section of this Report (pp. 25–38), as far as possible, with that of the same seeds produced elsewhere. With the exception of cotton seed and ground-nuts, Indian oil-seeds on the whole compare well with those produced elsewhere, and in some cases, *e.g.* copra, represent the best grade on the market. Indian oil-seeds are not always shipped, however, in clean and good condition, and, like other seeds exported from India, are liable to contain dirt and foreign seeds, which prejudicially affect their sale and selling values. This is a defect which should, ii possible, be remedied between sellers and buyers, for legislation in a matter of this kind is always a difficulty. The Committee would suggest, however, that the importance of the elimination of dirt and foreign matter in shipments of Indian oil-seeds should be kept continually before the trade, and every effort made to extend the use of a form of contract now in operation for certain seeds, which stipulates for clean and unmixed supplies, thereby saving freight and labour, as well as improving the reputation of Indian oil-seeds in consuming markets.

In the case of ground-nuts further action is necessary. It has been pointed out (p. 29) that these nuts are still generally shelled in India by a process of wetting, whereby serious deterioration is caused in the kernels. The remedy, machine-shelling, is already being applied with

success; but the bulk of Indian ground-nuts exported are still shelled by the old method. As a result, most of the Coromandel nuts exported are used only for the production of industrial oil. It is most important that machine-shelling of ground-nuts should become the general practice as soon as possible, if India is to secure any share in the rapidly increasing British demand for ground-nuts suitable for the production of edible oil and feeding-cakes.

Ground-nut shelling machines, suitable for working either by hand or power, are now obtainable both in this country and in the United States, and all that is necessary is that the Government of India should take all possible steps to encourage their use in India.

Oversea Transport of Indian Oil-seeds

The Committee are of opinion that Indian oil-seeds, in common with other commodities produced within the Empire, should, as far as possible, be shipped in vessels owned within the Empire. To facilitate this it is of the first importance that all possible steps should be taken to secure cheap transport facilities, under British control, between the different parts of the Empire. Consideration of the broad lines of policy necessary to secure this end is outside the scope of the present enquiry; but the Committee suggest that as one means of attaining this object there should be discrimination as regards tonnage dues, in favour of shipping owned within the Empire, on the following lines:

1. A lower scale of tonnage dues and port charges should apply in all ports in the Empire to ships owned within the Empire.

2. Privileges in the ports of the Empire should be accorded to shipping owned in allied or neutral countries, equivalent only to the corresponding privileges accorded to shipping owned within the Empire in the ports of allied or neutral countries.

3. Shipping owned in countries now at war with the Empire should pay in ports of the Empire dues twice as large as those paid by other shipping.

Transit and Re-export Trade

Most of the Indian exports of oil-seeds go direct to the consuming countries, but there is a considerable amount of re-export and transit trade, for which exact figures cannot be given. This trade takes place mainly through Germany, Holland, Belgium, and the United Kingdom, to Austria-Hungary, Russia, Denmark, Sweden, and Norway. In the case of France direct imports are encouraged by the surtaxe d'entrepôt.

The relative values of the re-export and transit trade of Germany and the United Kingdom in oil-seeds, and the causes (cheaper transit, lower port charges, and better financial facilities) which have led to the transfer of a large part of this trade from London to Hamburg, have been discussed (pp. 20–22).

India should therefore be encouraged to export oil-seeds direct to the country of ultimate destination, thus avoiding all intermediate charges. Where such direct shipment is not feasible, the necessary re-export and transit trade should be encouraged *via* British ports.

These changes could be brought about if the following suggestions were carried into effect :

1. *Shipping Facilities.*—Shipping facilities from both Indian and British ports should be developed and freights reduced, especially to Russia and the Scandinavian countries. If also freight rates from Indian to Mediterranean ports could be materially reduced, it would encourage the shipment of Indian oil-seeds to Austria-Hungary, which before the war was largely supplied *via* Germany (pp. 12–13).

British shipping companies should be asked to extend (*a*) the system of giving optional destinations for cargoes at a nominal fee, and (*b*) the practice of quoting cheaper through rates to British brokers and merchants for cargoes ultimately destined for Russian and Scandinavian ports.

2. *Port Charges.*—Charges in British ports, and more especially in London, which is the principal British centre of the re-export and transit trade in

oil-seeds, should be reduced to at least the same level as in the cheapest Northern Continental ports (p. 20).

3. *Financial Facilities.*—The attention of British banks should be called to the necessity of providing increased facilities to British merchants and brokers for the financing of cargoes and the giving of longer credits to foreign customers. Oil-seed crushers should also be given similar help in the export of oils and cakes (pp. 22–23).

Development of the British Oil-seed-crushing Industry

The questions so far discussed affect principally the trade in Indian oil-seeds. The possibility of increased British usage of Indian oil-seeds depends chiefly on the further development of the oil-seed-crushing industry in the United Kingdom. The present and pre-war positions of the industry have been discussed fully at pp. 19–25 of this Report; information has also been given as to the condition of the competing industries in Germany (pp. 10–17) and France (pp. 17–19).

It appears clear from this information that although the British industry would benefit indirectly, if the suggestions made above were carried into effect, it has special difficulties of its own which need attention and separate treatment.

Transport Rates and Facilities

It is not satisfactory that oil-cakes made in Germany could be delivered at towns on the east coast of Scotland or at an agricultural centre such as Bedford at prices lower than British-made oil-cakes could be delivered at the same points (p. 21), the difference in price, in favour of the German article, being due to low rates of transport across the North Sea. This special competition could be met to some extent by the provision of more and cheaper British coastal shipping facilities. This improvement, however, would not effect all that is required. The Committee are of opinion that in such cases British railway authorities should be required to reduce transport rates on the home-made article, and that in general in arranging

rates, the railway authorities should observe the principle of charging on home-made goods only what the traffic will bear, with due regard to the competition of similar imported articles.

It has also been pointed out (p. 22) that the cost of internal transport of oils and fats can be materially reduced by the use of tank wagons. It is not yet certain that such wagons can be safely used for the highest class of refined oils; owing to the risk of contamination, but there is no doubt as to their suitability for the transport of industrial and unrefined oils. The Committee are of opinion that a larger number of tank wagons should be provided by the railway authorities, and that in fact this should become the usual means of transporting industrial or unrefined oils and fats.

Equipment of Mills

On the whole, there seems to be no inherent difficulty in obtaining capital for the installation of new oil-mills or for re-equipping and re-modelling old ones (p. 22), apart from the serious pre-war obstacle, that the industry as a whole, under British conditions, gave too poor a return to be attractive to investors.

Oil-seed crushers would be encouraged to replace old plant and re-model their mills if the income-tax allowance for depreciation of plant and buildings were more liberal (p. 24). The Committee are of opinion that any system of making the allowance on a basis other than that of the rate of renewal necessary in the particular industry concerned must be unsatisfactory, since it does not encourage manufacturers to buy new plant and to re-model their mills. The allowance now usually made is too small, and the minimum standard should be 2½ per cent. on buildings and 10 per cent. on plant, with a further allowance for machinery worked more than 12 hours per day.

The plant obtainable in the United Kingdom for the extraction or crushing of oil-seeds appears to be satisfactory, and at least as efficient as any plant made abroad. This is not the case as regards plant for refining oils and for the manufacture of margarine, which, if not of foreign

manufacture, is usually of foreign design. It has been represented to the Committee that this subject should receive attention from British oil-mill machinery makers.

The processes available for the refining of oils are also probably capable of improvement, since it appears to be admitted that certain types of oils, notably ground-nut oil, can be better refined on the Continent than in the United Kingdom, possibly because British refiners have only recently begun to have experience of this oil.

These two subjects, viz. the improvement of oil-refining plant and the discovery of new and better processes for refining oils, are of special importance in view of the increasing manufacture of margarine and other edible oils and fats in the Empire, and the Committee are of opinion that the industries concerned should be assisted by an annual Government grant to carry out experimental work of this kind.

Supply of Raw Material

The suggestions just made for the improvement of the condition of the British oil-seed-crushing industry would not by themselves remedy its principal pre-war difficulty, viz. the competition of the Continental crusher, whose home market was heavily protected and who was in practice presented each year by his Government with a large margin of profit, which, at least in Germany, was used to secure a virtual monopoly of the supply of certain classes of oil-seeds (p. 16). The difficulty is not the usual one of the "dumping" of surplus produce (oils and oil-cakes) from the Continent, and especially Germany, in this country and elsewhere. This was serious enough, but it was a small evil compared with the fact that the British oil-seed crusher, with an inadequate margin of profit, could not compete in price with the German oil-seed crusher for the supplies of certain classes of oil-seeds (cf. Appendix A). His choice of raw material was therefore becoming more and more restricted; whilst at the same time the Indian and Colonial producer of oil-seeds was finding his market for certain classes of oil-seeds narrowed to one or two countries.

So far as can be seen at present, the position at the end of the war will be even worse, because during the war the world's immediately available sources of supply of oils and fats, both animal and vegetable, have seriously diminished. There is therefore certain to be an enormous demand for oil-seeds, and, if unrestricted competition for supplies is permitted, prices will rise to very high levels, and what is available will go to the countries whose oil-seed crushers can best pay these high prices.

The Committee are of opinion that preparations should be made to deal with the situation that is likely to arise as regards the supply of oil-seeds immediately after the war, and steps taken to ensure adequate supplies of oil-seeds being retained within the Empire. This could be achieved by the introduction of a system of rationing and licensing arranged between the British Empire and the Allied Powers which would prevent shipments to any other than agreed destinations.

It is, however, not enough to prepare only for this difficult period. The importance of oil-seeds as a source of supply of food, feeding-stuffs, and war materials makes the development of prosperous oil-seed-crushing industries throughout the Empire, and especially in the United Kingdom, a vital necessity. In view of this, the British oil-seed-crushing industry should not be allowed to revert to the uncertain condition of existence which characterised it before the war. The Committee have given a great deal of attention to this difficult subject, and have carefully discussed various possible remedies (cf. Appendix A). These include a preferential export duty on oil-seeds shipped from India, and the imposition of import duties on oils and fats imported into the United Kingdom from foreign countries. They desire to point out, however, that if a remedy of this character is decided upon eventually, it will have to depend on any general policy which may be adopted throughout the Empire for the conservation of industries which are of vital importance. It may also have to depend to a considerable extent on any joint policy which may be evolved by the Allied Nations for the utilisation of the raw materials produced in their respective territories.

A preferential export duty is a simple means of diverting trade in a desired direction, but it can only be applied, without prejudice to the producer, when the country imposing the duty has a monopoly of production, or is in a position to control production. It has been shown (pp. 25–38) that India has not a real monopoly of the production of any of the more important oil-seeds. In these circumstances the Committee feel that, although the imposition of a preferential export duty on Indian oil-seeds was strongly recommended by the majority of witnesses, they cannot in fairness to the Indian producer put the suggestion forward as a recommendation.

Of the possible remedies discussed therefore, the Committee are of opinion that, subject to the conditions referred to above, the most feasible, in the interests of the United Kingdom and India, the two countries with which this enquiry is specially concerned, would be the imposition in the United Kingdom of duties on all oils and fats of vegetable or animal origin and on goods containing them or their products, imported from countries outside the Empire. Provision should be made for drawbacks on goods made in the United Kingdom from imported oils or fats on which a duty has been levied, when these goods are exported. As this policy would be adopted mainly with a view to securing to the United Kingdom a fair share of raw materials essential to the continuation of an industry of vital importance, the schedule of duties might be so framed as to admit, free of duty or at a lower rate of duty, oils and fats made in foreign countries which do not themselves charge high import duties on oils and fats exported from British countries.

Summary of Suggestions for Action

The suggestions made by the Committee may be summarised as follows :

1. *Quality of Indian Oil-seeds.*

The Government of India should take steps to improve the quality of the ground-nuts exported from India, by encouraging in every possible way the introduction of shelling machines (p. 29).

The attention of the trade should be called to the fact that clean and unadulterated shipments of oil-seeds would save freight and labour, and would add to the reputation and selling value of Indian oil-seeds in consuming markets (p. 40).

2. *Oversea Transport of Indian Oil-seeds.*

Shipment of Indian oil-seeds in vessels owned within the Empire should be encouraged. To facilitate this, all possible steps should be taken to secure cheap transport facilities, under British control, between the different parts of the Empire. One means to this end would be by discrimination in favour of such shipping as regards dues and charges within the Empire (p. 41).

3. *Transit and Re-export Trade.*

Steps should be taken to provide better and cheaper shipping facilities from India and the United Kingdom to Russian, Scandinavian, Mediterranean, and other foreign ports, with which transit and re-export trade in Indian oil-seeds was carried on through foreign countries before the war (p. 42). Shipping companies should be asked to extend the system of giving optional destinations for cargoes at a nominal fee, and to develop the practice of quoting through rates to British merchants and brokers for cargoes ultimately destined for foreign countries (p. 42).

4. *Port Charges.*

It is desirable, especially in the interests of the British transit and re-export trade in oil-seeds, that charges in British ports should be reduced to at least the same level as those obtaining in the cheapest Northern Continental ports (p. 42).

5. *Financial Assistance from Banks.*

It is desirable that British banks should more readily give assistance to British oil-seed brokers and merchants engaged in transit and re-export trade in oil-seeds, in financing cargoes, and in arranging long credits for their

foreign clients (p. 43). They should also afford similar assistance, when necessary, to exporters of British-made oils and cakes (p. 43).

Development of the British Oil-seed-crushing Industry

6. *Transport Rates and Facilities.*

Railway rates on British-made oil-cakes should be reduced, so that it may no longer be possible for oil-cakes made on the Continent to be delivered at British towns, especially near the east coast, at lower rates than home-made oil-cakes (p. 43).

The attention of railway authorities should also be called to the fact that unrefined and industrial oils and fats can be transported more cheaply in tank wagons than in casks and drums, and it is suggested that they should provide a better supply of tank wagons for the transport of such oils (p. 44).

7. *Equipment of Mills.*

Income-tax Allowance.—The Board of Inland Revenue should be asked to revise the system of making allowances on income tax for the depreciation of plant and buildings, and to adopt the principle that the amount of allowance should depend on the renewals necessary in the particular industry concerned, the minimum standard allowance in any case being 2½ per cent. on buildings and 10 per cent. on plant, with a further allowance for machinery worked more than 12 hours per day (p. 44).

Improvement of Processes and Plant.—British oil-mill engineers should give more attention to the manufacture of oil-refining plant, and the oil-seed-crushing industry should institute experiments into the improvement of processes of refining oils (pp. 44–45). An annual Government grant should be made to the industries concerned for these purposes.

8. *Supply of Raw Materials.*

The Committee are of opinion that in view of the special difficulties affecting the supply of raw materials for the oil-

seed-crushing industry, it is desirable that, under th conditions which will arise immediately after the war a system of rationing and licensing should be arranged which will prevent shipments to other than agreed destinations (p. 46). If thereafter further assistance is required to secure to the British oil-seed-crushing industry a free choice of the raw material produced within the Empire an import duty on oils and fats of all kinds imported to the United Kingdom from foreign countries is the method recommended by which the better conditions necessary for this industry can be secured (p. 47).

In conclusion the Committee desire to place on record their high appreciation of the services rendered by their Secretary, Dr. T. A. Henry, and to thank him for the help and assistance he has given in drawing up this Report. They also desire to acknowledge with many thanks the services rendered by Dr. Henry and the Staff of the Imperial Institute in the compilation of the many statistical tables attached to the Report.

C. H. ARMSTRONG (*Chairman*).
ALFRED BIGLAND.
J. W. PEARSON.
MARSHALL REID.
THOMAS A. HENRY (*Secretary*).

May 30, 1918.

APPENDIX A

MEMORANDUM ON THE EFFECT OF IMPORT TARIFFS ON THE OIL-SEED-CRUSHING INDUSTRY

By J. W. Pearson

Chairman of the Seed-crushers' Association of the United Kingdom

In view of the evidence before the Committee to the effect that German crushers appeared to be in a position to capture and retain successfully certain sections of the seed-crushing trade in spite of British competition, it would seem to be useful to consider the effect of the German import tariff upon this industry.

Recognising that in the case of any raw material producing two separate finished articles of an entirely different character, the maximum price payable for the raw material would be regulated by the aggregate price obtained for the two finished articles, the German principle appears to have been based on the freedom of import of the raw material and the maintenance of a high price for the combined finished articles, secured through the medium of an import duty, against competition from outside. This form of protection was applied to the oil product only, and the import duty varied according to the article by impositions ranging up to practically £10 per ton. The effect of this £10 per ton duty upon the oil enabled the German crusher to obtain from £8 to £9 per ton more for his production than would have been obtainable in the case of free import. The apparent disadvantage of thus raising the internal price of such commodities was evidently neutralised by the fact that for the most part the oil formed the raw material for the manufacture of margarine consumed by the mass of the population and sold in small units. The oil contents of margarine being at the outside 85 per cent., the effect of a £10 duty, even if applied to all oils utilised, would not affect the retail price of margarine by more than ¾d. per lb. at the outside—a burden which might be regarded as inappreciable when spread over the mass of the consuming population.

For the purposes of examination, the oil-seeds affected by this import tariff on oils may be divided into two groups :

(*a*) Those oil-seeds of which both cake and oil products were consumed in Germany.

(*b*) Those oil-seeds of which the oil product only was consumed in Germany and the cake product exported to some other consuming country.

(*a*) A fair example of this class is palm kernels. The world's crop of this article was limited to about 300,000 tons per annum, produced only in West Africa. The oil equivalent of the whole crop was approximately 135,000 tons per annum. The German margarine makers were able to absorb the bulk of this quantity without difficulty. The residue of, say, 165,000 tons cake was almost entirely consumed in Germany for the purpose of pig feeding. There was practically no export of either cake or oil. Any small surplus of oil accumulated at any period was exported by Germany to England, and the high price obtained for her own consumption enabled a very much lower price to be taken for the export of such surplus. Inasmuch as the oil yield from palm kernels is about 45 per cent., it follows that every £1 per ton protection on the oil is equivalent to practically 10*s*. per ton protection on the seed. Assuming therefore that, as between British and German crushers, the costs of manufacture were equal, and the prices obtainable for the cake approximately the same, a protective duty of only £3 per ton upon the oil would enable the German crusher to bid at least 25*s*. per ton more for the seed than the English crusher could afford to pay, and this would be done at a cost to the nation of not more than ¼*d*. per lb. on the price of margarine. It would seem obvious that this form of protection might be increased to an almost unlimited extent to meet competition, and the maximum would only be reached when the ultimate effect on the price of margarine was sufficiently great to operate in the direction of restraining consumption. Before that point would be reached the price of the other product, i.e. cake, might be raised, and this in the case of palm kernels is, in fact, what took place, as the price of palm-kernel cake in

Germany was usually just a little higher than the price of palm-kernel cake in England. So long as the whole of the cake product of any seed in this group could be consumed in Germany, the price obtainable might be advanced up to the highest point at which it could compete with other similar feeding-stuffs in the country, and, where necessary, be protected by an import tariff. It is clear that in the case of this group no form of import tariff in England would be any protection, principally because there is no competition in England from the import of either cake or oil. It may be urged that there would appear to be no reason why the obtainable price of oil in free England should not be the same as the protected price of oil in Germany, but so long as other oils and fatty materials for human consumption were allowed to enter free, any substantial advance in the price of one oil or fat would immediately place it out of competition with other imported materials of a similar class. The margarine manufacturer in Germany was enabled to maintain his price for margarine through the protection afforded by the import duty on that article and other competing fats.

(*b*) A fair example of group (*b*) is to be found in the case of Egyptian cotton seed, a trade upon which the German crushers had only made a determined attack a few years before the war, and in which their competition had already enabled them to secure at least half the total Egyptian crop. In this case the German import tariff on cotton oil operated in exactly the same way as that described above for palm-kernel oil. The effect upon seed was not, however, quite so marked. As the yield of oil from Egyptian cotton seed is at best not more than 20 per cent., it follows that protection to the extent of £6 per ton on the price of cotton oil was required to enable the German crusher to outbid his English rival by £1 per ton on the seed. As the net profit obtained by the English trade would rarely average more than 5*s*. per ton, it is evident a much less degree of protection than this would be sufficient to enable the German competitor to outbid the English crusher. In this case, however, the cakes were not consumable in Germany, and, at the start of

the industry, at any rate, practically the whole production had to be exported. A large proportion of the German make was shipped to England, as the effect of cheap sailer freight in small cargo lots enabled the Hamburg crusher to deliver his cakes into practically any of the small east- and south-coast British ports at a lower price than the cake could be delivered by the big Hull or London mills, even assuming the same net price to be charged at the mill by the competing English and German crushers. To secure his market the German crusher was able to make use of part of the protection afforded in the price of his oil to reduce his price of cake at the mill sufficiently to enable him to compete successfully with the English crusher. The same factor put the German crusher in an excellent competitive position for dealing with the Danish and other North European ports, which were in the habit of importing cakes freely. In this case the operation of a tariff on the import of cakes in England might have raised the price of cake sufficiently to the English crusher to enable him out of that product to balance the German advantage through the higher price obtained for their oil. It will be seen that in considering the price that could be bid for seed, the addition of 5*s.* per ton to the price obtained for the cake is exactly equal to the addition of £1 per ton obtained in the price of oil. The protective tendency of any such small import duty on competing cakes would no doubt have been met in the course of time by fostering the home consumption in Germany. The actual effect of German competition in the cotton-seed market was that Germany was able to outbid England up to the full extent of her requirements in cotton seed, and only the surplus of the crop was left over for English crushers.

General.—The conclusion suggested by the above arguments is that no individual import tariff in England would have been any effective protection to the seed crusher against German competition. In the case of any particular oil-seed crop of a strictly limited size, the German tariff would appear to concede such advantages that the whole of the crop was at the command of the German buyers. In the case of other crops, where the

world's production was of such magnitude as to be far greater than could be solely dealt with in Germany, the effect of the tariff appeared to give the German crusher the advantage of being first able to supply all his own needs, with the power of selecting all the finer grades and qualities, and leaving over for competition amongst other importing countries only a surplus, which was in most cases substantially less than their combined crushing capacity. Under the principles of free import as prevailing in England, the value of any one article was obviously regulated by the values of other similar articles in the same group. Thus, an import tariff imposed on any individual oil would probably have but little effect, if of small magnitude; but if the effect of such tariff were to raise the price of the article appreciably, it would immediately go out of consumption, owing to the competition of other similar articles being imported. Exactly the same argument may be applied to cakes. In practice it was recognised that an advance of only 10*s.* per ton in the price of any one cake had the effect of immediately reducing the demand for that particular article, unless, at the same time, the whole group of cakes and competing feeding-stuffs were advanced in similar proportion. In order, therefore, that an import tariff might be made to afford any really efficient protection it would seem necessary that it should be applied not to individual cases but to entire groups of commodities —in fact, to enable a higher price to be charged for one particular oil, the whole group of competing oils must be raised. Similarly, to enable a higher price to be charged for a particular class of cake, the whole group of feeding-stuffs in England must be raised. The considered effect of such a proposition would probably necessitate the conclusion that the adoption of a general import tariff on all commodities might be the only final solution. It must be evident, however, that England can only bid the same price as her competitors for raw materials in the country of origin so long as she is able to obtain in the aggregate the same net results from the finished products.

(Signed) J. W. PEARSON.

LONDON.

February 7, 1918.

APPENDIX B

STATISTICAL TABLES

Table I. Indian Oil-seeds. Statistics of Area and Production, 1912–13 to 1916–17.

„ II. Indian Oil-seeds. Statistics of Exports: Quantities and Values, 1912–13 to 1916–17.

„ III. Principal Destinations of Exports of Indian Oil-seeds and Oil-seed Products, 1913–14.

„ IV. Summary of Trade and Details of Imports of Oil-seeds, Oil-cakes, and Oils in the Chief Consuming Countries:
- A. United Kingdom (1913).
- B. Germany (1912).
- C. France (1913).
- D. (Belgium (1913).
- E. Holland (1913).
- F. United States of America (1913–14).

„ V. Comparison of Trade in Oil-seeds and their Products in the United Kingdom, Germany, and France in the period 1895–1913.

„ VI. Summary of the Trade in Copra and Coconut Oil.

Notes on the Tables

In most Continental countries trade figures are given in the official returns under two headings—General and Special.

General trade, as a rule, includes total imports and exports—i.e. as regards imports, it covers imports for consumption and imports for re-export, and as regards exports, it includes both exports of home produce and any re-exports of foreign produce. The German general trade figures are exceptional in not including transit trade through the free ports of Hamburg, Lübeck, and Bremen.

Special trade is understood to mean, as regards *imports*, produce imported for home consumption or manufacture, or which has become " nationalised " by the payment of duty, and as regards *exports*, produce which has been grown, manufactured, or in some way improved in the country, or which has been " nationalised " by the payment of duty.

In the accompanying Tables IV and V figures for general trade have been used wherever they are available, and where they are not available the fact that figures for special trade are used is indicated. The extent to which *general* differs from *special* trade in any country is indicated in the summaries placed at the head of each section of Table IV.

In the case of the United Kingdom and the United States, *general exports* means re-exports plus exports of domestic or home-manufactured produce, and *special imports* means *general imports* less re-exports.

Table I. Indian Oil-seeds

Statistics of Area and Production, 1912–13 *to* 1916–17

		1912–13.	1913–14.	1914–15.	1915–16.	1916–17.[1]
Linseed	area, acres	4,124,900	3,031,000	3,325,000	3,333,000	3,532,000
	yield, tons	542,100	386,200	397,000	476,000	520,000
Rape and mustard	area, acres	5,955,800	6,266,400	6,507,000	6,437,000	6,440,000
	yield, tons	1,241,200	1,087,500	1,219,200	1,102,100	1,181,200
Sesame	area, acres	4,989,500	5,076,000	5,565,000	5,108,000	5,015,000
	yield, tons	474,000	403,500	551,000	482,000	493,000
Ground-nut	area, acres	1,366,400	2,105,900	2,413,000	1,673,000	2,317,000
	yield, tons	669,900	748,800	947,000	1,058,000	1,147,000
Cotton	area, acres	22,028,000	25,023,000	24,595,000	17,746,000	21,212,000
	yield, tons[2]	1,921,000	2,110,000	2,170,400	1,557,300	1,708,400
Castor, niger, poppy, mowra, copra, tea		No returns available.				

Figures taken from "Estimates of Area and Yield of Principal Crops in India," 1916–17.

[1] *Figures for* 1916–17 *are provisional and subject to revision.*
[2] *Calculated at the rate of* 2½ *times the weight of cotton fibre.*

Table II. Indian Oil-seeds

Statistics of Exports: Quantities and Values, 1912–13 *to* 1916–17

		1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Linseed	*tons*	354,489	413,873	321,576	192,987	394,103
	£	5,318,383	4,457,998	3,502,411	1,982,782	4,759,906
Cotton seed	*tons*	130,563	284,326	207,788	95,663	39,630
	£	685,127	1,416,743	1,004,524	445,077	203,940
Ground-nuts	*tons*	243,350[1]	277,907[1]	138,322[1]	175,443[1]	143,794[1]
	£	2,694,520	3,254,246	1,515,608	1,668,957	1,670,076
Sesame	*tons*	77,858	112,200	46,705	13,776	83,665
	£	1,215,783	1,796,841	711,885	164,170	1,083,723
Mustard	*tons*	3,652	5,104	2,552	3,177	6,074
	£	60,580	70,724	40,400	55,778	116,977
Rape	*tons*	217,829	249,005	96,911	95,214	121,748
	£	2,403,453	2,851,711	1,083,719	938,576	1,180,108
Niger	*tons*	5,684	4,107	2,330	589	—
	£	57,843	42,926	22,154	4,823	—
Poppy	*tons*	23,402	18,980	6,992	6,871	5,524
	£	370,799	310,589	95,610	82,012	63,085
Copra	*tons*	34,349	38,191	31,845	15,677	26,556
	£	858,865	1,039,826	821,923	381,859	665,058
Mowra	*tons*	13,293	33,298	7,437	4,215	4,239
	£	142,913	363,634	50,674	24,327	26,480
Castor	*tons*	110,630	134,887	82,814	87,948	92,447
	£	1,092,177	1,336,649	773,289	802,185	957,201
Tea seed	*tons*	666	392	219	137	137
	£	110,188	55,002	36,442	28,660	28,376
Other sorts	*tons*	1,318	515	1,231	280	1,931
	£	11,378	3,496	11,258	2,811	17,686
Total	*tons*	1,217,089	1,572,791	946,727	691,983	920,143
	£	15,022,089	17,000,385	9,669,897	6,582,017	10,772,616

Figures taken from the "Annual Statement of the Sea-borne Trade of British India," except those for 1916–17, *which are from the "Monthly Accounts Relating to the Sea-borne Trade of India," March* 1917.

[1] *Excluding exports grown in British India, but shipped via French-India ports.*

Table III. Principal Destinations of Exports of Indian Oil-seeds and Oil-seed Products, 1913–14

Description.	Unit.	Total.	United Kingdom.	Germany.	France.	Belgium.[1]	Holland.	Italy.	Austria-Hungary.
Coconut (copra)	*tons*	38,191	352	23,989	3,410	5,045	837	—	497
Coconut cake	*tons*	4,208	125	4,066	—	—	—	—	—
Coconut oil	*gallons*	1,091,477	223,756	161,632	8,492	43,571	29,283	5,566	2,858
Mowra seed	*tons*	33,298	—	28,383	424	4,439	50	—	—
Cotton seed	*tons*	284,326	279,198	489	2,295	—	—	—	—
Cotton-seed cake	*tons*	10,427	8,954	1,469	—	—	—	—	—
Cotton-seed oil	*gallons*	2,507	1,702	—	—	—	—	—	—
Sesame seed	*tons*	112,200	—	16,510	22,207	33,779	249	14,293	19,342
Sesame oil	*gallons*	208,053	4,196	—	—	—	—	—	—
Sesame, rape and linseed cake	*tons*	89,488	18,197	1,207	—	76	—	—	—
Castor seed	*tons*	134,887	55,675	9,761	20,988	14,822	—	11,788	—
Castor cake	*tons*	4,902	—	—	—	—	—	—	—
Castor oil	*gallons*	1,007,001	87,256	—	—	—	—	—	—
Rape seed	*tons*	249,005	14,099	58,198	53,943	98,868	3,024	13,726	5,472
Mustard seed	*tons*	5,104	900	328	2,384	1,028	20	—	3
Rape and mustard oil	*gallons*	407,178	8,580	2,072	—	—	—	—	—
Ground-nuts	*tons*	277,907[2]	480	9,436	222,379	16,607	—	1,225	10,705
Ground-nut cakes	*tons*	62,026	32,720	12,166	—	—	—	—	—
Ground-nut oil	*gallons*	288,190	—	—	11,241	—	—	—	—
Linseed	*tons*	413,873	157,314	48,326	115,459	38,459	9,575	30,656	6,500
Linseed oil	*gallons*	102,360	6,636	3,576	—	—	—	—	—
Poppy seed	*tons*	18,980	—	3,308	10,678	4,779	50	47	—
Niger seed	*tons*	4,107	367	2,029	1,047	20	25	50	566
Other oil seeds	*tons*	908	378	12	35	20	—	—	14
Other oil cakes	*tons*	4,259	282	50	—	—	—	—	—
Other oils	*gallons*	135,321	7,987	57,475	—	39,235	7,897	—	—
Totals—Seeds	*tons*	1,572,791	508,765	200,774	455,253	217,872	14,632	71,785	43,099
Cakes	*tons*	175,313	60,279	18,959	—	76	—	—	—
Oils	*gallons*	3,242,087	340,113	224,755	19,735	82,806	37,180	5,566	2,858

Figures taken from "Annual Statement of the Sea-borne Trade of British India."

[1] *Considerable quantities of these seeds are re-exported to Germany.*

[2] *Excluding exports of ground-nuts grown in British India but shipped via French-Indian ports.*

Table IV. Summary of Trade and Details of Imports of Oil-seeds, Oil-cakes and Oils in the Chief Consuming Countries

Table IVa. United Kingdom, 1913

	Tons.	£
Oil-seeds.		
General imports	1,505,252	15,888,367
General imports from India	421,886	4,076,909
General exports	47,233	910,440
Special imports	1,458,187	14,980,590
Special exports	168	2,663
Transit trade[1]	21,391	476,809
Chief Oil-seeds Imported (General Imports)		
Copra	30,868	896,707
Other nuts and kernels	50,252	1,036,345
Castor	60,276	710,587
Cotton	615,332	4,648,617
Linseed	606,308	7,195,399
Rape	49,178	531,725
Soya beans	76,452	635,747
Other oil-seeds	16,586	235,240
Vegetable Oils		
General imports	207,133	7,688,067
General imports from India	1,402	55,243
General exports	145,879	4,519,623
General exports to India	1,687	58,260
Special imports	153,164	6,046,153
Special exports	91,910	2,877,709
Transit trade[1]	3,640	155,077
Chief Vegetable Oils Imported (General Imports)		
Coconut	58,477	2,658,715
Palm and palm kernel	81,021	2,468,809
Castor	1,399	41,875
Cotton	17,656	590,025
Linseed	11,888	310,670
Rape	7,599	222,556
Olive	7,801	515,448
Other oils (including cocoa butter)	21,292	879,969
Oil-cakes		
General imports	406,700	2,539,892
General imports from India	62,730	397,565
General exports	56,306	375,568
Special imports	403,842	2,518,668
Special exports	53,448	354,344
Transit trade[1]	751	4,563

[1] *Free goods in transit on through bills of lading, but exclusive of goods transhipped under bond; the latter does not include any oil-seeds or oil-seed products.*

Table IVa—continued

Chief Oil-cakes Imported (General Imports)

	Tons.	£
Cotton seed	236,723	1,407,023
Linseed	83,679	626,118
Rape seed	28,882	156,592
Other oil-cakes	57,416	350,159

Figures taken from the "Annual Statement of the Trade of the United Kingdom with Foreign Countries and British Possessions."

Table IVb. Germany, 1912[1]

Oil-seeds.

	Metric tons.	£
General imports	1,487,944	23,563,700
General imports from India	291,044	4,785,900
General exports	43,897	645,700
Special imports	1,443,447	22,873,400
Special exports	18,891	285,850
Transit trade	209,270	Not recorded

Chief Oil-seeds Imported (General Imports)

Rape	131,226	1,723,450
Camelina[2] oil, radish, etc.	3,956	39,550
Mustard	17,691	247,500
Poppy and sunflower	28,841	577,800
Ground-nuts	70,763	957,900
Sesame	103,352	1,848,000
Linseed and meal	329,745	5,235,500
Hemp	7,337	74,550
Cotton	216,534	1,777,850
Soya beans, illipe and shea nuts, mowra and castor	128,229	1,210,150
Palm kernels	264,361	5,019,700
Copra	184,580	4,835,050
Other oil-seeds, including madia, kapok and niger seed, nutmeg fat, wood oil, etc.	1,229	16,700

Vegetable Oils

General imports	105,823	3,367,500
General imports from India	811	33,100
General exports	76,296	3,187,100
General exports to India	—	—
Special imports	96,610	3,066,500
Special exports	72,148	3,040,750
Transit trade	Not shown separately	

[1] *Complete figures for German trade in* 1913 *are not available.*
[2] *German "Dotter."*

Table IVb—continued

Chief Vegetable Oils Imported (General Imports)

	Metric tons.	£
Rape	1,037	30,550
Linseed	3,538	124,350
Soya bean, etc.	11,358	312,500
Ground-nut	1,080	45,200
Olive	3,638	244,700
Olive (2nd quality)	4,889	142,450
Cotton-seed	29,043	843,650
Wood oil	6,888	249,850
Castor	8,961	258,400
Beech-nut, poppy, niger, sunflower, etc.	5,750	202,100
Palm-kernel	14,114	416,000
Coconut	1,167	46,650
Mowra, etc.	1,302	39,200
Other oils, including sesame, cocoa butter, nutmeg, etc.	1,460	74,000
Fatty acids	11,598	337,000

Oil-cakes

General imports	821,426	6,067,700
General imports from India	37,202	278,200
General exports	264,242	1,707,000
Special imports	749,190	5,823,000
Special exports	263,622	1,702,900
Transit trade	Not shown separately	

Chief Oil-cakes Imported

Details not given

Details of Transit Trade in Oil-seeds in Germany, 1912

Oil-seeds, including rape seed, dotter, etc., mustard, poppy and sunflower seeds, ground-nuts, madia, niger, etc., sesame, linseed, hemp seed, cotton seed, soya beans, illipe, castor, etc., palm kernels, copra, and other oil seeds

	1912. Metric tons. In.	Out.
Total	209,270	209,270

Sources and Destinations

	In.	Out.
Belgium	157	2,287
Denmark	3	27,186
France	254	25
Great Britain	224	6,935
Italy	45	196
Netherlands	713	12,202
Norway	—	2,344
Austria-Hungary	155	112,901
Portugal	75	1,932
Roumania	272	102
Russia	6,759	33,965
Finland	—	1,172
Sweden	33	5,393
Switzerland	—	488

Table IVb—continued

	1912. Metric tons. In.	Out.
Spain	54	431
Turkey	629	—
Egypt	6,947	—
British East Africa	783	—
British South Africa	62	—
British West Africa	46,639	—
German East Africa	2,030	4
German South-west Africa	385	—
Cameroons	759	—
Togoland	526	—
French West Africa	664	—
Belgian Congo	316	—
Liberia	69	—
Morocco	1,007	—
Portuguese East Africa	2,066	—
Portuguese West Africa	242	—
Aden, etc.	10	—
British India, etc.	32,414	91
British Malacca, etc.	7,884	—
Ceylon	7,031	—
China	10,393	—
Kiaochau	89	—
French India	13	—
Japan	357	—
Netherlands East Indies, etc.,	30,974	—
Philippines, etc.	7,272	—
Argentine	22,799	798
Brazil	15	21
Newfoundland, etc.	489	—
Colombia	55	—
Dominican Republic	554	—
Ecuador	26	—
Dutch America	51	—
Haiti	3,294	—
Uruguay	188	—
Venezuela	164	—
United States	468	791
Australian Commonwealth	9,420	—
New Zealand	120	—
Christmas Island, etc.	2,213	—
German Australia (*sic*)	1,048	—
Samoa Islands	956	—

Figures taken from "Statistik des Deutschen Reichs."

Table IVc. France, 1913

Oil-seeds.

	Metric tons.	£
General imports	1,101,639	16,774,756
General imports from India	408,109	5,878,850
General exports	94,310	1,523,162
Special imports	1,024,186	15,502,080
Special exports	23,557	334,622
Transit trade	565	9,160

Table IVc—continued

Chief Oil-seeds Imported (General Imports)

	Metric tons.	£
Ground-nuts	532,087	7,689,670
Copra	123,360	3,626,778
Linseed	251,402	2,921,286
Mustard, ravison, navette and colza	55,360	755,728
Sesame	27,817	500,698
Hemp	14,913	134,216
Cotton seed	18,577	170,908
Palm kernels	3,270	66,708
Other oil seeds	74,853	908,764
Vegetable Oils		
General imports	66,967	2,538,787
General imports from India	nil	nil
General exports	87,160	3,370,569
General exports to India	small	small
Special imports	49,574	1,792,280
Special exports	52,826	2,202,924
Transit trade	3,550	141,560
Chief Vegetable Oils Imported (General Imports)		
Olive	23,856	1,144,149
Palm	21,283	593,338
Cotton	12,026	457,583
Coconut, etc.	3,924	155,960
Linseed	3,233	73,761
Colza and navette	761	17,684
Ground-nut	481	16,378
Other oils (including cocoa butter)	1,403	79,934
Oil-cakes		
General imports	101,952	693,270
General imports from India	nil	nil
General exports	215,560	1,551,729
Special imports	101,673	690,696
Special exports	214,801	1,546,567
Transit trade	585	3,960

Chief Oil-cakes Imported

Details not given.

Figures taken from "Tableau Général du Commerce et de la Navigation," 1913, *Vol. I.*

Table IVd. Belgium, 1913

Oil-seeds

	Metric tons.	£
General imports[1]	566,201	7,656,721
General imports from India	177,997	2,269,677
General exports	318,715	4,188,197
Special imports	512,053	6,769,455
Special exports	264,566	3,300,932
Transit trade	54,149	887,265

[1] *In the Belgian returns the general trade is the sum of special and transit trade.*

Table IVd—continued

Chief Oil-seeds Imported (General Imports)

	Metric tons.	£
Linseed	293,783	3,378,515
Rape, etc.	103,299	1,311,891
Copra	19,686	600,424
Other palm nuts	5,102	113,259
Other oil-seeds, etc.	144,331	2,252,632
Vegetable Oils		
General imports [1]	47,758	1,720,800
General imports from India	nil	nil
General exports	46,309	1,402,244
General exports to India	61	1,447
Special imports	43,584	1,527,042
Special exports	42,135	1,208,486
Transit trade	4,174	193,758
Chief Vegetable Oils Imported (General Imports)		
Palm	7,896	290,567
Cotton	6,912	241,370
Linseed	9,094	217,900
Coconut	4,027	181,234
Olive	2,264	159,947
Ground-nut	1,692	72,757
Castor	423	11,943
Other (including cocoa butter)	15,451	545,084
Oil-cakes		
General imports [1]	266,459	2,131,669
General imports from India	275	2,199
General exports	65,901	527,205
Special imports	257,367	2,058,935
Special exports	56,809	454,471
Transit trade	9,092	72,734

Chief Oil-cakes Imported

Details not given.

Figures taken from the "Tableau Général du Commerce de la Belgique," 1913.

[1] *In the Belgian returns the general trade is the sum of special and transit trade.*

Table IVe. Holland, 1913

Oil-seeds		
General imports [1]	920,200	12,465,993
General imports from India	15,620	165,608
General exports	616,273	9,875,646
Special imports	689,509	9,247,843
Special exports	324,328	5,022,180
Transit trade	306,972	4,827,080

[1] *For general trade no values for details are given in the Dutch Returns, nor do they distinguish between oil-seeds and other seeds. In this schedule the missing details have, where possible, been calculated on the basis of the special trade figures.*

Table IVe—continued

Chief Oil-seeds Imported (Special Imports)

	Metric tons.	£
Linseed	286,035	2,860,350
Copra	100,635	3,019,046
Rape and colza	47,909	578,894
Ground-nuts	67,428	786,660
Palm kernels	63,711	637,110
Soya beans	27,554	211,250
Mustard	3,207	41,009
Hemp	3,328	30,508
Other oil-seeds	89,622	1,082,935

Vegetable Oils

General imports	549,149	not given
General imports from India	11	not given
General exports	526,820	not given
General exports to India	nil	nil
Special imports	77,860	2,714,719
Special exports	56,356	2,185,645
Transit trade	474,942	not given

Chief Vegetable Oils Imported (Special Imports)

Coconut	16,685	695,230
Cotton-seed	26,417	660,420
Palm	23,915	996,441
Ground-nut	2,964	111,158
Sesame	1,505	56,448
Rape and colza	2,179	54,482
Soya bean	2,874	71,845
Linseed	551	10,563
Poppy	26	966
Other edible oils	303	9,343
Cocoa butter	441	47,820

Oil-cakes.

General imports	not shown	
General exports	not shown	
Special imports	347,681	3,078,110
Special exports	103,643	867,803
Transit trade	not shown	

Chief Oil-cakes Imported (Special Imports)

Linseed	275,122	2,521,951
Rape	4,585	35,139
Ground-nut	1,719	14,321
Cotton-seed	25,276	200,104
Other	40,879	306,595

Figures taken from "Statistik van den in uit en door voer."

Table IVf. United States of America, 1913–14

	Tons.	£
Oil-seeds		
General imports [1]	279,505	3,334,368
General imports from India	20,133	206,728
General exports	18,887	231,105
Special imports [1]	276,912	3,294,540
Special exports	18,530	223,616
Transit trade	not shown in detail	
Chief Oil-seeds Imported (General Imports)		
Linseed	216,330	2,202,377
Copra	20,284	498,961
Castor	23,003	237,356
Ground-nuts	19,888	395,674
Vegetable Oils		
General imports	152,218 [2]	6,005,994
General imports from India	1,516	69,686
General exports	95,955	3,315,396
General exports to India	1	23
Special imports	149,803	6,048,380
Special exports	95,303	3,254,975
Transit trade	not shown in detail	
Chief Vegetable Oils Imported (General Imports)		
Olive	28,674	1,748,789
Coconut	33,208	1,396,654
Palm	25,910	803,750
Palm-kernel	15,324	643,196
Chinese-nut	20,654	408,830
Ground-nut	5,474	191,378
Soya-bean	7,304	173,082
Cotton-seed	7,720	217,673
Cocoa butter	1,267	165,302
Rape-seed	5,981	146,803
Linseed	802	19,074
Other oils	—	91,460
Oil-cakes		
General imports	5,204	25,016
General imports from India	nil	nil
General exports	683,195	4,514,098
Special imports	5,155	24,732
Special exports	683,195	4,514,098
Transit trade	not shown separately	
Chief Oil-cakes Imported (Special Imports)		
Cotton-seed	2,564	11,086
Cotton and linseed	1,074	5,069
Corn	40	255
Soya	1,412	7,969
Other	63	351

Figures taken from "The Foreign Commerce and Navigation of the United States."

[1] *The totals for general and special trade in oil-seeds are not shown separately. The figures in this Table represent the totals of the four principal oil-seeds, which are separately recorded.*

[2] *Excluding "other oils," for which quantities are not stated.*

Table V. Comparison of Trade in Oil-seeds and their Products in the United Kingdom, Germany and France in the Period 1895–1913

Table Va. United Kingdom

	1895. Tons.	1895. £	1903. Tons.	1903. £	1913. Tons.	1913. £
1. *Oil-seeds*						
a. General imports	886,755	6,356,764	1,108,131	8,799,382	1,505,252	15,888,367
b. General imports from India	128,764	1,225,388	388,589	2,891,160	421,886	4,076,909
c. General exports	76,233	775,973	62,233	675,026	47,233	910,440
d. Special imports	810,522	5,580,791	1,040,254	8,128,706	1,458,187	14,980,590
e. Special exports	not recorded		209	4,350	168	2,663
f. Total retained	810,522	5,580,791	1,040,254	8,128,706	1,458,187	14,980,590
g. Transit trade	not recorded		7,602	89,751	21,391	476,809
2. *Oils*[1]						
a. General imports	134,012	3,055,351	153,813	3,881,934	207,133	7,688,067
b. General imports from India	5,437	122,966	6,197	160,017	1,402	55,243
c. General exports	101,213	2,177,786	104,939	2,486,939	145,879	4,519,623
d. General exports to India	800	17,479	1,091	32,666	1,687	58,260
e. Special imports	81,953	1,867,876	99,013	2,577,299	153,164	6,046,153
f. Special exports	49,154	990,311	49,818	1,182,295	91,910	2,877,709
g. Total retained	81,953	1,867,876	99,013	2,577,299	153,164	6,046,153
h. Transit trade	not recorded		3,429	101,790	3,640	155,077
3. *Oil-cakes*						
a. General imports	313,618	1,603,650	367,791	2,165,430	406,700	2,539,892
b. General imports from India	6,373	33,394	11,713	68,214	62,730	397,565
c. General exports	1,506	7,015	5,381	33,413	56,306	375,568
d. Special imports	312,112	1,596,635	362,410	2,132,017	403,842	2,518,668
e. Special exports	not recorded		not recorded		53,448	354,344
f. Total retained	312,112	1,596,635	362,410	2,132,017	403,842	2,518,668
g. Transit trade	not recorded		2,145	16,032	751	4,563

NOTES.—"*General imports*" *include imports for home consumption, in transit and for re-export.*
"*General exports*" *include special exports and re-exports.*
"*Special imports*" *are, for the United Kingdom, the difference between total imports and re-exports, and equal the total retained for consumption or manufacture.*
"*Special exports*" *are exports of home produce.*
"*Transit trade*" *is included in total imports and exports.*

[1] *The oils include cocoa butter.*

Table Vb. Germany

	1895. Metric tons.	1895. £	1903. Metric tons.	1903. £	1912.[1] Metric tons.	1912.[1] £
1. *Oil-seeds*						
a. General imports . . .	585,762	5,284,750	834,635	8,786,250	1,487,944	23,563,700
b. General[2] imports from India .	148,688	1,460,000	288,657	3,024,320	291,044	4,785,900
c. General exports . . .	49,088	433,950	34,819	360,850	43,897	645,700
d. Special imports . . .	561,639	5,082,550	820,077	8,633,400	1,443,447	22,873,400
e. Special exports . . .	35,212	305,100	27,422	270,800	18,891	285,850
f. Transit trade[3] . . .	21,955	252,000	71,246	784,450	209,270	—
2. *Oils*						
a. General imports . . .	95,920	1,845,200	105,585	2,168,450	105,823	3,367,500
b. General[2] imports from India .	1,115	19,508	1,666	34,644	811	33,100
c. General exports . . .	33,109	596,400	47,514	925,050	76,296	3,187,100
d. Special imports . . .	95,335	1,828,200	104,368	2,165,700	96,610	3,066,500
e. Special exports . . .	31,686	561,450	46,223	893,750	72,148	3,040,750
f. Transit trade[3] . . .	21,500	465,562	19,748	383,850	—	—
3. *Oil-cakes*						
a. General imports . . .	316,797	1,357,400	504,884	2,866,350	821,426	6,067,700
b. General[2] imports from India .	8,804	35,216	14,199	77,029	37,202	278,200
c. General exports . . .	95,140	440,150	170,213	840,800	264,242	1,707,000
d. Special imports . . .	316,199	1,354,750	502,742	2,855,400	749,190	5,823,000
e. Special exports . . .	95,133	440,100	170,213	840,800	263,622	1,702,900
f. Transit trade[3] . . .	2,296	10,621		not given separately		

Figures taken from "Statistik des Deutschen Reichs."

[1] *Details for 1913 not available in the case of Germany.*

[2] *The imports from India are "general" imports in each case, except for the year 1912, when the "special" figures only are available.*

[3] *Not included in general exports.*

Table Vc. France

	1895.		1903.		1913.	
	Metric tons.	£	Metric tons.	£	Metric tons.	£
1. *Oil-seeds*						
a. General imports	689,920	6,556,972	854,125	9,213,998	1,101,639	16,774,760
b. General imports from India	318,041	3,170,276	385,994	4,330,639	408,109	5,878,850
c. General exports	34,993	374,580	51,467	609,060	94,310	1,523,162
d. Special imports	662,599	6,266,197	826,840	8,889,787	1,024,186	15,502,080
e. Special exports	12,048	119,501	25,762	279,286	23,557	334,622
f. Transit trade	108	993	55	468	565	9,160
2. *Oils*						
a. General imports	78,015	1,725,000	85,835	2,282,118	66,967	2,538,787
b. General imports from India	207	4,885	1,219	25,548	—	—
c. General exports	71,580	1,702,800	70,169	1,919,886	87,160	3,370,569
d. General exports to India	—	—	too small to	be shown	—	—
e. Special imports	58,654	1,291,080	62,505	1,620,157	49,574	1,792,280
f. Special exports	51,516	1,314,320	50,698	1,220,683	62,826	2,202,880
g. Transit trade	1,738	42,690	2,706	67,478	3,550	141,560
	The weight of oil includes that of the container.					
3. *Oil-cakes*						
a. General imports	75,662	484,237	128,180	640,902	101,952	693,270
b. General imports from India	—	—	431	2,154	—	—
c. General exports	110,767	753,216	143,925	719,623	215,560	1,551,729
d. Special imports	75,085	480,546	126,997	634,985	101,573	690,696
e. Special exports	110,190	749,290	142,742	713,712	214,801	1,546,567
f. Transit trade	465	2,973	909	4,543	585	3,960

Table VI. Summary of the Trade in Copra and Coconut Oil

Exports of Copra from the Principal Copra-producing Countries of the World

1913.	Tons.
British Countries	157,527
Allied Countries	104,020
Enemy Countries	32,377
Neutral Countries	243,500
Total	537,424

From British Countries

Ceylon	55,865
India	38,192
Federated Malay States	9,269
Non-Federated Malay States	19,208[1]
Seychelles	2,938
Tonga Islands Protectorate	3,426
Fiji	7,929
Papua	845[2]
Solomon Islands	4,196
Gilbert and Ellice Islands	3,500
East Africa Protectorate	1,564
Zanzibar	9,451
Gold Coast	629
Trinidad	515
Total	157,527

From Allied Countries

	Tons.
French Indo-China	5,645
French Oceania	9,011
New Caledonia	2,960
Portuguese East Africa	4,000[2]
Philippine Islands	80,904
Samoa (American)	1,500[2]
Total	104,020

From Enemy Countries

Samoa (German)	11,021[3]
East Carolines, etc.	4,747[3]
German New Guinea	11,190[3]
West Carolines, etc.	1,085[3]
Togoland	161[2]
German East Africa	4,173[2]
Total	32,377

From Neutral Countries

Netherlands East Indies	243,500
Total	243,500

[1] *Including an estimate of 12,500 for Johore.*
[2] *Estimated.*
[3] 1912 *figures.*

The position of the United Kingdom, Holland and the United States has altered considerably during the war, and all these countries are now importing and crushing more copra.

	Imports. Tons.	Re-exports. Tons.	Used. Tons.
United Kingdom.			
1913	30,868	16,664	14,204
1914	66,494	24,334[1]	42,160
1915	118,540	75,111[1]	43,429
1916	62,400	12,089	50,311
Holland.			
1913	100,635	82,356	18,279
1914	110,311	77,130	33,181
United States.			
1912–13	15,298	—	15,298
1913–14	20,284	—	20,284
1914–15	40,243	79	40,164
1915–16	49,142	57	49,085

[1] *Chiefly to Holland.*

France and Russia, on the contrary, are importing and using less. The imports into Russia fell from 66,690 tons in 1913 to 38,309 tons in 1914.

The change in the position of the trade in Australia is shown in the following table :

	Imports. Tons.	Re-exports. Tons.	Used. Tons.
1913 (calendar year)	5,861	517	5,344
1914–15 (year ended June 30)	16,356	327	16,029

The following table shows the exports of coconut oil from the principal tropical producing countries :

From :	1912. Tons.[1]	1913. Tons.[1]	1914. Tons.[1]	1915. Tons.[1]
Ceylon	20,089	27,349	24,324	25,075
India[2]	4,006	4,591	7,539	8,450
Philippines	—	4,931	10,748	13,249
Australia[3]	5,162	1,977	4,231	—

[1] *242 gallons = 1 ton.*
[2] *Indian figures are for financial, not calendar years.*
[3] *Chiefly oil expressed from imported copra.*

Other countries whence a little copra is exported, regularly or occasionally, are Mexico, the Republic of Dominica, Haiti, Venezuela, Colombia, Honduras, Ecuador, Jamaica, British Guiana and British Honduras.

The share of India in the world's exported surplus of copra for 1913 is therefore about 7 per cent., and that of the British Empire nearly 30 per cent.

The exports of copra from the British producing areas in 1914 and 1915 are shown in the following table as far as figures are available :

From :	1914. Tons.	1915. Tons.
Ceylon	70,597	60,426
India	31,845	15,678
Federated Malay States	14,500	13,342
Non-Federated Malay States	18,642	16,079
Seychelles	3,174	2,915
Tonga Islands Protectorate	3,500[1]	3,500[1]
Fiji	9,429	15,238
Papua	1,003[1]	635[1]
Solomon Islands	4,000[1]	4,000[1]
Gilbert and Ellice Islands	4,500	5,000
East Africa Protectorate	1,586	1,386
Zanzibar	9,978	10,286
Gold Coast	656	770
Trinidad	1,052	1,780
Jamaica	32	85
	174,484	151,120

[1] *Estimated.*

The chief importing countries for copra in 1913 were as follows:

	Imports. *Tons.*	Re-exports. *Tons.*	Used. *Tons.*
United Kingdom	30,868	16,664	14,204
Australia	5,861	517	5,344
France	123,360	11,032	112,328
Russia	66,690	—	66,690
Belgium	19,552	6,958	12,594
Germany	196,449	549	195,900
Austria-Hungary	33,605	—	33,605
Holland	100,635	82,356	18,279
United States	15,298	—	15,298
			474,242

It is clear from these figures that the chief copra importing and using countries in normal times are Germany (195,900 tons) and France (112,328 tons).

II

THE INDIAN TRADE IN OIL-SEEDS

Summary of General Information Prepared at the Imperial Institute for the Committee

No country in the world produces such a variety of oil-seeds in commercial quantities as India. West Africa has probably a greater variety of this class of raw materials, but of these only two, palm kernels and ground nuts, are of great commercial importance.

The great value of India's trade in oil-seeds is not generally realised, in spite of the fact that the production in India is probably well over 5,000,000 tons in quantity and £50,000,000 in value per annum. The exports of oil-seeds from India in 1913–14 amounted to nearly 1,600,000 tons, valued at approximately £17,000,000. To this there must be added an export of about 3,250,000 gallons of oil valued at nearly £400,000, and an export of nearly 200,000 tons of oil-cake worth about £1,000,000. The annual value of the export trade of India in oil-seeds and their products may therefore be placed at about £18,500,000, taking 1913–14 as an average year.

According to the official Indian Trade Returns, about one-third by weight of the oil-seeds exported from India in 1913–14 was sent to the United Kingdom, but only a little more than one-fifth by value, the principal items in the United Kingdom imports being the relatively cheap seeds, linseed and cotton seed. About one-quarter by weight of the exports in the same year, but about one-third by value,

went to France, the chief items exported to France being ground-nuts and linseed. Germany's share of the exports in the same year amounted to about one-eighth by weight, but about one-sixth by value, the chief items being the relatively valuable seeds, copra, mowra and sesame, followed by rape seed and linseed. The other countries which in 1913–14 shared to a considerable extent in India's exports of oil-seeds were Belgium (chiefly linseed and rape seed), Italy (largely linseed and sesame seed), and Austria-Hungary (chiefly sesame and ground-nuts). Between them these six countries absorbed 1,500,000 tons out of the 1,600,000 tons of oil-seeds exported from India in that year, and the first four divided among them no less than 1,380,000 tons.

At first sight it would appear that if the United Kingdom were able to take about one-third of India's output of oil-seeds in 1913–14, whilst France took one-quarter and Germany one-eighth, the position was not unsatisfactory from the point of view of the development of inter-Imperial trade. But careful comparison of the position of the oil-seed-crushing industry in the United Kingdom and in the more important oil-seed-crushing Continental countries shows that the position is not so satisfactory as appears on the surface, either from the point of view of the Indian oil-seed producer or the British oil-seed crusher.

It has been considered desirable therefore to publish a comprehensive statement on the Indian oil-seed trade, with the twofold object of calling attention to its great importance, and of emphasising the desirability of securing that a far larger proportion of India's output of oil-seeds shall be utilised in the Empire than has been the case in the past. No attempt can be made here to suggest what steps, if any, should be taken to secure the latter object, and all that can be done is to call attention to the present position, or rather to the position as it was in 1913–14. In some respects it has altered to the advantage of this country since the outbreak of war, but it can hardly be assumed that this will be a permanent alteration if conditions after the war resemble those obtaining in 1913–14.

The article is divided into two sections—General and Special—the former dealing with the trade in general and

the latter with the individual oil-seeds of which the trade is composed.

GENERAL SECTION

OIL-SEEDS EXPORTED FROM INDIA

The principal oil-seeds grown in and exported from India are as follows :

Copra.	Linseed.	Rape.
Ground-nuts.	Sesame.	Cotton.
Mowra.	Castor.	Niger.
Poppy.		

These may be classified according to the character of the oil they yield as follows :

1. *Solid Fats.*—Copra, mowra.
2. *Non-drying Oils.*—Ground-nut, castor.
3. *Semi-drying Oils.*—Cotton seed, rape, sesame.
4. *Drying Oils.*—Linseed, poppy seed, niger seed.

A better classification from the manufacturers' point of view is that of the amount of oil obtained from the seeds, since this determines to some extent the type of machinery required to deal with them. On this basis they may be grouped as follows :

Group 1 (13 to 36 per cent. of oil or fat).—Cotton, linseed, niger, rape.

Group 2 (42 to 65 per cent. of oil or fat).—Poppy, ground-nut, sesame, castor, mowra, copra.

GENERAL CHARACTER OF THE BRITISH OIL-SEED-CRUSHING INDUSTRY

Speaking generally, British oil-seed crushers have devoted attention mainly to the treatment of seeds belonging to group 1, that is, seeds giving a comparatively low yield of oil and a large yield of oil-cake. Most British oil-seed crushing mills are still equipped with machinery for dealing with this group of seeds, though in recent years, and

especially since the outbreak of war, the condition of things has been modified to some extent, and increasing quantities of the richer oil-seeds, such as copra, palm kernels and ground-nuts, are being crushed or extracted in this country. Much, however, still remains to be done in this direction. The reason for the backward condition of the British oil-seed crushing industry, taken as a whole, is mainly that it began in the days when oil-cake for feeding cattle was the chief desideratum and the oil a relatively unimportant material, and this has largely determined the kind of seed crushed. The demand for oils for the manufacture of margarine and other edible fats arose on the Continent and expanded there far more rapidly than in this country, and with its expansion grew up the modern Continental, and especially German, oil-seed crushing and extracting industry, the chief object of which was to produce edible oils and fats. The German oil-seed crushers, therefore, gave special attention to copra, palm kernels, mowra seed and other seeds rich in oil. Further, they began later than their British competitors and therefore had the advantage of later equipment and plant, and more modern arrangement of factories. In recent years the German oil-seed crushers have not only monopolised to a large extent the crushing of the rich oil-seeds, but they have also made serious inroads into the crushing of cotton seed, which, so far as Europe is concerned, had been until the last few years practically a British monopoly. Similarly they have entered largely into the production of oil and cake from Manchurian soya beans—an industry which, so far as Europe is concerned, owes its existence to the enterprise of oil-seed crushers in Hull.

Statistics of India's Trade in Oil-seeds, Oils and Oil-cakes

1. *Oil-seeds*

The following tables show (1) the crop yields and total exports for the year 1913–14 (as far as information is available) of the various descriptions of oil-seeds grown in India, and (2) the distribution of the exports :

Description of seed.	Crop yield.	Exports. Quantity.	Value.
	Tons.	Tons.	£
Ground-nut . .	749,000	278,000	3,254,000
Linseed . .	386,000	414,000	4,460,000
Rape } . .	1,087,000	{ 249,000	2,850,000
Mustard }		{ 5,000	70,000
Sesame . .	503,000	112,000	1,800,000
Cotton . .	2,120,000	284,000	1,417,000
Castor . .	Figures not available	135,000	1,337,000
Copra . .	,, ,, ,,	38,000	1,040,000
Mowra . .	,, ,, ,,	33,000	364,000
Poppy . .	30,000	19,000	311,000
Niger. . .	Figures not available	4,000	43,000
Total .	—	1,571,000	16,946,000

Destinations of Exports (Principal Countries)

Description of seed.	United Kingdom.	France.	Belgium.[1]	Italy.	Germany.	Austria-Hungary.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Ground-nut . .	500	222,400	16,600	1,200	9,400	10,700
Linseed . .	157,300	115,500	38,500	30,700	48,300	6,500
Mustard . .	900	2,400	1,000	—	300	—
Rape . . .	14,100	53,900	98,900	13,700	58,200	5,500
Sesame . .	—	22,200	33,800	14,300	16,500	19,300
Cotton . .	279,200	2,300	—	—	500	—
Castor . .	55,700	21,000	14,800	11,800	9,800	—
Copra . . .	300	3,400	5,000	—	24,000	500
Mowra . .	—	400	4,400	—	28,400	—
Poppy . .	—	10,700	4,800	—	3,300	—
Niger . . .	370	1,050	20	50	2,030	570
Total. .	508,370	455,250	217,820	71,750	200,730	43,070

[1] *In part re-exported to enemy countries.*

2. *Oils*

The destinations of India's exports of vegetable oils are many and various. The following tables show the principal destinations of the exports of the various oils in 1913–14:

Castor oil.

To	Gallons.
United Kingdom	87,256
Ceylon . .	73,730
Straits Settlements .	141,414
Natal . .	47,925
Mauritius . .	92,050
Australia . .	360,252
New Zealand .	146,659
Siam . .	16,273
Portuguese East Africa . .	8,365
Other countries .	33,077
Total . .	1,007,001
Value .	£92,504

Coconut oil.

To	Gallons.
United Kingdom	223,756
Natal . .	13,262
Sweden . .	119,541
Germany. .	161,632
Holland . .	29,283
Belgium . .	43,571
U.S.A. . .	447,664
Other countries	52,768
Total .	1,091,477
Value .	£155,073

Linseed oil.

To	Gallons.
United Kingdom	6,636
Hong Kong .	22,740
Australia. .	18,355
New Zealand .	28,330
Germany. .	3,576
Philippines .	8,506
Japan . .	5,509
Other countries	8,708
Total .	102,360
Value .	£17,493

Ground-nut oil. To	Gallons.	Mustard and rape oils. To	Gallons.	Sesame oil. To	Gallons.
Ceylon	159,232	United Kingdom	8,580	Aden	35,647
Mauritius	107,308	Natal	94,916	Ceylon	31,609
France	11,241	Mauritius	189,651	Maskat	63,510
Other countries	10,409	British Guiana	31,267	German East Africa	10,443
		Fiji	41,329	Other countries	66,844
		Other countries	41,435		
Total	288,190	Total	407,178	Total	208,053
Value	£30,013	Value	£48,624	Value	£28,699

Niger-seed Oil—None in 1913–14

Other Vegetable Oils.

To	Gallons.
United Kingdom	7,987
Ceylon	14,418
Germany	57,475
Holland	7,897
Belgium	39,235
Other countries	8,309
Total	135,321
Value	£12,900

Grand total of exports of oils: Gallons, 3,242,807 Value, £385,653.

3. *Oil-cakes*

The following table shows the exports of oil-cakes from India in 1913–14 and their chief destinations:

Description of cake.	United Kingdom. Tons.	Ceylon. Tons.	Germany. Tons.	Japan. Tons.	Total. Tons.
Castor cake	—	4,902	—	—	4,902
Coconut cake	125	—	4,066	—	4,208
Cotton-seed cake	8,955	5	1,469	—	10,428
Ground-nut cake	32,720	14,967	12,167	—	62,026
Linseed, rape and sesame cakes	18,198	24,683	1,207	45,284	89,488
Others	282	2,330	—	1,086	4,259
Total	60,280	46,887	18,909	46,370	175,311

The data recorded in the foregoing tables may be conveniently summarised as follows:

Indian Oil-seeds, Oil-cakes and Oils. Export Statistics for the Year 1913–14

Description.		Total exports.	United Kingdom.	France.	Exported to Belgium.	Italy.	Germany.	Austria-Hungary.
Ground-nuts .	. *tons*	278,000[1]	500	222,400	6,640[2]	1,200	19,360[3]	10,700
Ground-nut cake	. ,,	62,026	32,720	—	—	—	12,167	—
,, oil	*galls.*	288,190	—	11,241	—	—	—	—
Linseed . .	. *tons*	414,000	157,300	115,500	23,100[2]	30,700	63,700[3]	6,500
,, oil .	*galls.*	102,360	6,636	—	—	—	3,576	—
Rape seed .	. *tons*	249,000	14,100	53,900	54,900[2]	13,700	102,200[3]	5,500
Mustard seed .	. ,,	5,104	900	2,384	1,029	—	328	4
Rape and mustard oil	*galls.*	407,178	8,580	—	—	—	—	—
Sesame seed .	. *tons*	112,000	—	22,200	17,800[2]	14,300	32,500[3]	19,300
,, oil .	*galls.*	208,000	4,000	—	—	—	—	—
Linseed, rape and sesame cakes .	. *tons*	89,500	18,198	—	—	—	1,207	—
Cotton seed .	. ,,	284,000	279,200	2,300	—	—	500	—
,, ,, cake	. ,,	10,428	8,955	—	—	—	1,469	—
,, ,, oil	*galls.*	2,500	—	—	—	—	—	—
Castor seed .	. *tons*	135,000	55,700	21,000	14,800	11,800	9,800	—
,, cake .	. ,,	4,902	—	—	—	—	—	—
,, oil .	*galls.*	1,007,000	87,256	—	—	—	—	—
Copra . .	. *tons*	38,000	300	3,400	4,000[2]	—	25,000[2]	500
,, cake .	. ,,	4,208	125	—	—	—	4,066	—
,, oil .	*galls.*	1,091,500	223,756	—	43,571	—	161,632	—
Mowra seed .	. *tons*	33,000	—	400	4,400	—	28,400	—
Niger seed .	. ,,	4,107	367	1,046	20	50	2,029	566
Poppy seed .	. ,,	19,000	—	10,700	4,800	—	3,300	—
Tea seed .	. ,,	392	65	—	—	—	—	—
Other oil seeds (non-essential) .	. *tons*	516	379	35	20	—	12	14
Other oil-cakes	. ,,	4,259	282	—	—	—	50	—
Other oils .	*galls.*	135,321	7,987	—	39,235	—	57,475	—

[1] *Exclusive of* 105,500 *tons, largely the produce of British India, exported from French Possessions in India* (86,500 *tons from Pondicherry*). *Most of these exports went to Marseilles.*

[2] *Corrected for re-exports to Germany.*

[3] *Includes imports from Belgium.*

The following points regarding the more important oil-seeds included in the foregoing tables may be noted :

Ground-nut.—Much more than half the crop was retained ; the oil is largely consumed in India, and the cake is used as a manure for high-priced crops. It is also used by the tea planters of Ceylon and Southern India for the same purpose. The value of the oil and cake exported was about £300,000.

In the last few years a ground-nut crushing industry has begun to develop in Burma.

Linseed.—Practically the whole of the crop is exported. India imported 438,000 gallons of linseed oil from the United Kingdom in 1913-14.

The export of linseed in 1913–14 was larger than the yield recorded for that year. This was due to the fact that the yield for that year was considerably below the average, and the exports during the year comprised a portion of the previous year's crop. The average yield for the three years 1911–12 to 1913–14 was 520,000 tons, whilst the average export was 430,000 tons.

Rape, Mustard and Sesame.—About one-quarter of each of these crops was exported. The value of the oils and cakes exported was over £600,000. The seeds are largely crushed in India for their oils.

Cotton.—The quantity exported was equal to 15 per cent. of the estimated yield for 1913. The seed is largely crushed locally for its oil and cake. In the Punjab, however, the whole of the local yield of the seed, as well as seed obtained from other parts of India, estimated altogether at 225,000 tons, is used as food for milch cows. The value of cotton cake exported from India was about £50,000, of which Burma contributed more than half, although her share of the cotton-seed crop of India was about 1 per cent.

Castor.—About 1,000,000 gallons of oil valued at £100,000 were exported, principally to countries within the Empire. The seed is crushed locally for the oil and cake. The cake has been used in Northern India as a manure for tea.

Copra.—The value of coconut oil and cake exported was £180,000. A very large quantity of oil and cake is produced and consumed in India.

Poppy.—Probably the bulk of the crop was exported.

An immense quantity of oil is manufactured in India by crude processes. Most of the oil is expressed by pestle and mortar mills worked by bullocks, and by hand presses, which exist in all parts of the country, and supply largely the local demand for oils. Within recent years oil mills, fitted with modern machinery and worked by steam or other mechanical power, have been set up in various parts of the country (cf. below); but, in spite of the good local

demand for edible oils, many of the attempts to establish mills on a large scale have failed. This is attributed to the want of technical and commercial knowledge on the part of the management, and failure to recognise the necessity for erecting only the best and most modern machinery and of securing efficient scientific control. In Burma especially the oil-crushing industry is, however, now being developed on sound lines by leading European firms, and considerable quantities of ground-nut cake are being exported to the United Kingdom; in 1915–16 for the first time shipments of ground-nut oil were made from Burma. Burma has the advantage of the experience gained by a long-established rice-milling industry, which is largely in the hands of British firms. Many of the Chinese and Indian rice millers in Burma are men of considerable intelligence and enterprise, and might be able to manage oil-mills successfully.

Much discussion has taken place in India regarding the desirability of continuing to export large quantities of oil-seeds instead of crushing them in the country and exporting the oil and cake, or selling these products locally. The usual arguments in favour of encouraging oil-seed crushing in India are:

(1) That the profits of the industry would be secured for India;

(2) That the cakes would be largely retained in India to be used as feeding-stuffs and manures, and would thus be of advantage to Indian agriculture;

(3) That India, in starting an oil-seed-crushing industry, would be competing mainly with industries established in foreign countries; and

(4) That by crushing the fresh oil-seeds in India better oils could be produced than are now obtained from stale oil-seeds in Europe.

The arguments on the other side as usually stated may be summarised thus:

(1) That the quantity of oil-seeds exported forms a relatively small proportion of the oil-seeds produced, and that the first consideration should be to use economically and to the best advantage, which is not the case now, the large quantities of oil-seeds retained and used in India.

(2) That India is pre-eminently an agricultural country,

and there is no reason why it should not, like Java, develop on agricultural lines. The yield per acre of practically every crop grown in India could be increased, and it would be far sounder economically to give attention to the development of agriculture with a view to increased exports of raw materials than to attempt to start new industries.

(3) That the profits accruing to India from an increased output and an improvement in the quality of oil-seed crops would be greater than she could get at this stage by developing oil-producing industries, and the profits would be shared among a greater number of people.

(4) India already exports some oil and cake, indicating that her actual requirements of these articles are adequately met. It is well known also that the people are unable or unwilling to buy cake to any large extent, and that if under present circumstances oil-seed crushing on a large scale were developed in India, most of the cake and oil would have to be exported. Consequently Indian agriculture would not benefit to any great extent.

(5) It is highly improbable that India could produce for many years to come refined oils of the kind required in Europe, and the oil made would probably have to be refined in Europe.

SPECIAL SECTION

As already indicated, this section of the article will be devoted to considering separately the various oil-seeds included in Indian trade. No attempt has been made to achieve uniformity of treatment, especially on technical points. In all cases attention has been concentrated on the points about which information seems most to be needed in the interests of the development of Indian trade, particularly within the British Empire.

COTTON SEED

The world's production of cotton seed in 1913–14 may be taken to be about 11,000,000 tons, made up as follows :

	Tons.		*Tons.*
United States . .	5,620,000	Egypt . . .	620,000
India . . .	2,120,000	Russia . . .	440,000
China . . .	1,600,000	Other countries .	600,000

On this basis India produces about 20 per cent. of the world's supply of cotton seed. Of the cotton seed produced in these countries, much is either used locally or is exported in the form of manufactured products. The following, for example, are the exports of cotton seed and cotton-seed products from the United States in 1914–15 :

Exports.	Quantity.	Value.
	Tons.	£
Cotton seed . .	2,819	18,847
„ „ oil . .	142,128	4,374,590
„ „ cake .	545,848	3,086,425
„ „ meal .	114,449	694,849

In India and Egypt, as the following figures show, the exports of cotton seed are far larger than those of cotton-seed products ; but in the case of India the total exports form only a small part of the total production :

Exports from India, 1914–15

Exports.	Quantity.	Value.
	Tons.	£
Cotton seed . .	207,789	1,004,524
„ „ oil . .	52	1,059
„ „ cake . .	6,854	31,660

Exports from Egypt, 1915

Exports.	Quantity.	Value.
	Tons.	£
Cotton seed . .	360,000	2,410,496
„ „ oil . .	4,262	79,472
„ „ cake . .	111,668	508,511

India and Egypt, and especially the latter, are the chief sources of supply of cotton seed to those countries which produce none.

The following table shows the world's export trade in cotton seed in the last year before the outbreak of war :

World's Export Trade in Cotton Seed

Exporting country.	Exports. Quantity.	Value.	Remarks.
	Tons.	£	
Egypt (1913) .	428,136	3,377,375	221,113 tons (52 per cent.) to United Kingdom ; 191,900 tons (45 per cent.) to Germany. In 1912 and earlier years there was a much bigger difference between exports to United Kingdom and Germany in favour of United Kingdom.
India (1913–14) .	284,327	1,416,743	279,198 tons to United Kingdom.
British East Africa, chiefly Uganda (1913–14) .	9,019	34,684	8,694 „ „ „
Nigeria (1913) .	5,887	14,332	

World's Export Trade in Cotton Seed—continued

Exporting country.	Exports. Quantity. Tons.	Value. £	Remarks.
Sudan (1913) .	4,709	21,624	4,396 tons to United Kingdom.
Nyasaland (1913-14)	86	329	
St. Vincent (1913).	524	3,065	Mainly to Barbados.
Grenada (1913) .	506	2,779	Two-thirds to United Kingdom, one-third to Barbados.
St. Kitts (1913) .	206	1,339	Mainly to Barbados.
Exports from British Empire	733,359	4,872,269	
United States (1913–14) .	7,295	43,023	6,159 tons to Germany.
China (1913) .	10,863	33,584	10,829 tons to Japan.
Brazil (1913) .	47,629[1]	—	United Kingdom imports only. These account for the bulk of Brazil's exports of cotton seed. According to the latest Brazilian returns, these exports in 1912 totalled 36,204 tons, of which 33,481 tons were consigned to the United Kingdom. Probably in the case of the following countries also the bulk of the exports of cotton seed are taken by the United Kingdom.
Turkey (1913) .	26,639[1]	—	United Kingdom imports.
Russia (1913) .	17,770[1]	—	" " "
Peru (1913) .	12,745[1]	—	" " "
Hayti and S. Domingo (1913) .	1,992[1]	—	" " "
Exports from foreign countries	124,933	—	

[1] *Part only.*

Though the above table is unavoidably incomplete, it may be estimated that probably under 900,000 tons of cotton seed entered into foreign trade in 1913–14, *i.e.* only about one-twelfth (8 per cent.) of the world's production. The chief consuming country was the United Kingdom, which took about two-thirds of the total exports, the remainder going mostly to Germany.

Of the world's exportable surplus of cotton seed, as distinct from cotton-seed manufactures, the British Empire produces about 80 per cent. and India about 33 per cent.

Trade in Cotton-seed Oil

The figures in the following tables of world trade in cotton-seed oil are extracted from the *Year Book* of the United States Department of Agriculture. " The exports

given are domestic exports, and the imports given are imports for consumption as far as it is feasible and consistent so to express the facts" :

Exports

Country.	1911. 1,000 galls.	1912. 1,000 galls.	1913. 1,000 galls.
United States of America	43,004	47,457	35,304
United Kingdom	6,782	6,099	7,626
Belgium	1,042	1,341	1,014
Egypt	488	359	619
France	177	172	271
Netherlands	43	40	31
Others	6	40	59
Total[1]	51,542	55,508	44,924

[1] *This does not include exports from China, which have increased rapidly in the last few years. Converting these Chinese exports into gallons (at* 9·2 *lb. = a gallon), for comparsion with the above, the figures are*

1912 . 183,000 *galls.* 1913 . 964,000 *galls.* 1914 . 1,842,000 *galls.*

In normal years China exports cotton-seed oil chiefly to the United Kingdom and Turkey.

Imports

Country.	1911. 1,000 galls.	1912. 1,000 galls.	1913. 1,000 galls.
United Kingdom	7,361	7,587	4,990
Canada	1,830	2,911	4,104
Malta	261	261	278
Egypt	186	345	118
Australia	119	182	175
Total British	9,757	11,286	9,665
Italy	3,599	5,388	3,957
France	2,609	3,697	2,604
Belgium	2,337	2,876	2,005
Serbia[1]	396	396	396
Senegal	464	382	382[2]
Martinique	275	262	262[2]
Algeria	128	118	118[2]
Roumania	805	593	593[2]
Germany	6,391	7,900	4,786
Austria-Hungary	15	127	16
Netherlands	3,544	7,048	7,765
Mexico	673	4,310	4,310
Norway	1,492	1,554	1,542
Sweden	680	865	702
Brazil[3]	670	670	440
Uruguay[4]	383	383	383
Others	4,146	4,306	6,466
Total	38,364	52,161	46,392

[1] *Figures for* 1911.
[2] *Figures for preceding year.*
[3] *Figures for* 1909 *in first two columns.*
[4] *Figures for* 1910.

It will be seen that in 1912 three countries—the United Kingdom, Germany and the Netherlands—shared almost equally over 40 per cent. of the supplies of cotton-seed oil entering into foreign trade, each taking between 7,000,000 and 8,000,000 gallons ; while another 40 per cent. was shared by Italy, Mexico, France, Canada, Belgium and Norway, whose imports ranged from between 5,000,000 and 6,000,000 gallons (Italy) down to 1,500,000 gallons (Norway).

Of the exports shown in the table on p. 87 the United States furnished about 80 per cent. and the United Kingdom about 14 per cent., the United Kingdom exports of home produce being about equal to the imports of foreign produce. The rise of China among exporting countries is of special interest. Already she would seem to take third place. A more detailed statement of the exports from the United States and the United Kingdom, based on their respective trade returns, is given below.

In 1913–14 the exports of cotton-seed oil from the United States were 86,144 tons valued at £2,768,636. The distribution of these exports is very widespread, the chief receiving countries before the war being the Netherlands, Italy, United Kingdom, Canada, Mexico, Argentina, France and Germany. The exports in 1913–14 were exceptionally small. Following are the figures for 1912–13, 1913–14 and 1914–15 :

United States Exports of Cotton-seed Oil

	1912–13.		1913–14.		1914–15.	
	Tons.	*Per cent.*	*Tons.*	*Per cent.*	*Tons.*	*Per cent.*
Netherlands . . .	34,300	24	12,100	14	40,600	29
Italy	17,600	12·5	6,300	7·5	7,100	5
United Kingdom . .	14,200	10	13,900	16	33,200	23·5
Canada	11,300	8	11,400	13	9,200	6·5
Mexico	10,600	7·5	2,800	3	2,100	1·5
Argentina . . .	6,600	5	6,700	8	7,700	5·5
France	8,000	6	3,700	4·5	3,800	2·5
Germany	5,300	4	3,400	4	30	—
Norway	4,000	3	3,100	3	11,800	8
Denmark	1,200	1	900	1	5,900	4
Total ten countries .	113,100	81	64,300	74	121,430	85·5
Total all countries .	140,700	100	86,100	100	142,100	100

It will be seen that in 1912–13 and 1913–14 the United Kingdom, the Netherlands, Italy and Canada took fully

half the total; in 1914–15 the United Kingdom and the Netherlands alone took over half the total, and there were large increases in the exports to Norway and Denmark in that year.

The exports of refined cotton-seed oil from the United Kingdom, classed among home produce and manufactures, in 1913, 1914 and 1915 were as follows:

United Kingdom Exports of Cotton-seed Oil

	1913.		1914.		1915.	
To	*Tons.*	*Per cent.*	*Tons.*	*Per cent.*	*Tons.*	*Per cent.*
Netherlands	7,538	30	14,662	54·5	14,865	69
Belgium	3,251	13	2,244	8	—	—
France	3,214	13	974	3·5	1,527	7
French West Africa	1,562	6	1,855	7	1,155	5·5
United States	2,151	8·5	540	2	5	—
Germany	1,994	8	767	3	—	—
Turkey	1,128	4·5	502	2	45[1]	—
Other countries	4,175	17	5,518	20	3,908	18·5
Total quantity	25,013	100	27,062	100	21,505	100
Total value	£755,083	—	£864,037	—	£677,909	—

[1] *Exported to ports or places in territory formerly Turkish, but now occupied by other Powers.*

In 1916 the exports of refined cotton-seed oil produced in the United Kingdom dropped to 2,407 tons, valued at £101,197, of which 16·5 per cent. went to the Netherlands, 30 per cent. to France, 12·5 per cent. to French West Africa and 41 per cent. to other countries (including 24·5 per cent. to British Possessions).

There is, as a rule, only a small export of unrefined cotton-seed oil from the United Kingdom, as is indicated in the following table. Most of the exports in the exceptional year 1915 went to the Netherlands:

	Quantity. *Tons.*	Value. £
1913	522	15,453
1914	438	13,198
1915	4,702	127,208
1916	170	6,289

Trade in Cotton-seed Cake and Meal

The following table shows the exports of cake from the chief producing countries so far as figures are available :

Country.	Exports. Quantity. Tons.	Exports. Value. £	Remarks.
United States [1] (1913–14)	357,131	2,201,488	90 per cent. to Denmark, Germany and United Kingdom, viz. to Denmark, 155,171 tons (43 per cent.); to Germany, 107,299 tons (30 per cent.); to United Kingdom, 58,613 tons (16 per cent.). In the two previous years, total exports were about 50 per cent. higher, the above three countries still taking the bulk of the supply.
Egypt (1913)	62,870 [2]	303,191 [2]	62,530 tons to United Kingdom. The exports were much smaller than usual in 1913. Both in 1912 and in 1914 the quantity was nearly 30 per cent. higher.
Russia (1912)	86,000 (part only)	—	Russia's estimated export to Germany (50,000 tons) and Denmark (36,000 tons). See U.S.A. Special Agents' Series, No. 84, pp. 25, 79.
Germany (1913)	71,040 (part only)	—	Germany's export to United Kingdom alone, according to United Kingdom Trade Returns. The German Trade Returns do not distinguish between the different kinds of oil-cake exported. In 1912 when United Kingdom imports of cotton-seed cake from Germany were 70,617 tons, Germany's production was 160,000 tons, little of it being for home consumption (U.S.A. Special Agents' Series, No. 84, p. 26).
China (1914)	33,544 (part only)	86,000	Exports from Shanghai, comprising most of the exports of cotton-seed cake from China. Mostly sent to Japan.
India (1913–14)	10,429	48,157	8,955 tons to United Kingdom.
United Kingdom (1913)	7,762	36,638	Practically all to foreign countries, chiefly France and Denmark.

[1] *In 1914–15 the figures for cake and meal were given separately, and in that year the exports of cake were nearly four times as large as the exports of meal.*

[2] *Exports of "tourteaux" ("oil-cakes"). As previously noted, practically all these exports go to the United Kingdom, and as the Egyptian figures for exports of "tourteaux" to the United Kingdom are very little in excess of the United Kingdom figures for imports of cotton-seed cake from Egypt, there can be little error in regarding "tourteaux" as practically equivalent in this instance o cotton-seed cake.*

Principal Importing Countries for Cotton Seed and Cotton-seed Products

The average annual imports of cotton seed, cotton-seed oil, and cotton-seed cake and meal into the chief importing countries in the four years 1910–13 were as follows:

Country.	Cotton seed. Tons.	Oil. Tons.	Cake and meal. Tons.
United Kingdom	633,145	21,952	218,729
Germany	173,978	18,850	n.s.m.
France	28,187	11,026	"
Austria-Hungary	5,832	270	"
Netherlands	n.s.m.	23,000 [1]	29,087 [2]
Italy	"	15,895 [3]	n.s.m.
Denmark	"	3,221	197,043

n.s.m. = not separately mentioned in the Trade Statistics.

[1] *According to United States Department of Agriculture. According to the Netherlands Trade Returns the average of* 1913, 1914 *and* 1915 *was much less.*
[2] *Average of* 1912–13. *Large quantities of cake and meal are re-exported from the Netherlands.*
[3] *Average of* 1911–13.

It is clear from these figures that, so far as countries which do not themselves produce cotton seed are concerned, the United Kingdom and Germany were, before the war, the only countries which possessed a large cotton-seed-crushing industry, and that although Germany's cotton-seed imports were increasing they were still far below those of the United Kingdom. Further, the United Kingdom takes practically the whole of India's output of cotton seed, and also the greater part of the cotton-seed oil and cake exported from India. It should be borne in mind, however, that the United Kingdom may not continue to take so much Indian cotton seed if after the war she is able to buy Egyptian seed on more advantageous terms than Germany. Up to 1905 the United Kingdom took practically the whole of the cotton seed produced in Egypt, but in that year the competition of Germany as a buyer began to be felt, and purchases by Germany increased fairly steadily up to the outbreak of war, as the following table shows:

Exports of Cotton Seed from Egypt

Year.	Total. Tons.	To United Kingdom. Per cent.	To Germany. Per cent.
1900	391,233	92·3	n.s.m.
1905	413,794	94·4	0·08
1910	317,516	66·0	28·9
1911	453,432	66·1	29·9
1912	582,748	57·5	37·2
1913	428,136	51·6	44·8
1914	338,757	72·5	24·0
1915	359,981	99·2	nil.
1916	215,348	99·7	nil.

n.s.m. = not separately mentioned.

It was probably this competition for Egyptian cotton seed which led British oil-seed crushers to turn their attention to Indian cotton seed, which began to be exported in quantity about 1900.

Exports of Cotton Seed from India

Year.	Total. Cwts.	To United Kingdom. Cwts.	Per cent.
1894–5	96,769	74,716	77
1900–01	224,901	138,506	62
1901–2	2,036,056	1,693,811	83
1905–6	3,891,339	3,476,848	89
1910–11	5,980,226	5,803,091	97
1914–15	4,155,778	4,048,818	97
1915–16	1,913,273	1,865,326	98
1916–17	792,608	748,675	94

Quality of Indian Cotton Seed compared with Egyptian

Indian cotton seed is inferior to Egyptian seed and realises from £2 to £3 per ton less in the market. This is mainly due to the fact that it is a " fuzzy " instead of a " smooth " cotton seed and therefore yields an inferior feeding-cake, unless it is delinted and then hulled to produce decorticated cake, which is not the practice in the United Kingdom. Further, it yields only about 13 per cent. of oil as compared with 16 to 17 from Egyptian seed, and the oil is more troublesome to refine, though this difficulty is said now to have been overcome.

The average composition of " Bombay " and " Egyptian " undecorticated cotton cake is given by Dr. J. A. Voelcker as follows :

	Undecorticated cotton cake. "Bombay."	"Egyptian."
Moisture	11·6	12·3
Oil	4·6	5·1
Albuminous compounds [1]	19·4	22·9
Digestible carbohydrates, etc.	38·0	33·7
Woody fibre	20·1	20·7
Mineral matter	6·3	5·3
	100·0	100·0
[1] *Containing nitrogen*	3·1	3·6

Linseed

World's Production

The production of linseed in the chief producing countries of the world during the years 1911 to 1914, according to the *Annuaire International de Statistique Agricole*, was as follows :

Exporting Countries

	1911. Tons.	1912. Tons.	1913. Tons.	1914. (Returns not yet completed.) Tons.
Argentina	572,400	1,130,000	995,000	1,125,500
Russia [1]	569,031	621,973	703,490	—
India	570,206	650,067	547,243	388,333
Canada	255,928	663,728	445,508	182,257
United States	492,017	713,082	453,484	395,214
Uruguay	22,317	33,073	24,451	14,000

[1] *European and Asiatic.*

Countries whose Imports exceed their Production

	1911. Tons.	1912. Tons.	1913. Tons.	1914. (Returns not yet completed.) Tons.
Roumania	14,229	18,233	13,445	3,906
Austria-Hungary	22,496	16,524	15,453	—
France	12,608	14,640	7,626	—
Belgium	13,085	13,055	9,824	—
Italy	8,660	8,720	10,300	8,200
Netherlands	14,290	10,557	8,276	—

Algeria, Morocco, China, Bulgaria, Japan, Turkey and Sweden produce small quantities of linseed.

World's Exportable Surplus

The following table shows the quantities of linseed exported from the chief linseed-producing countries of the world during the years 1909–13:

	1909. Tons.	1910. Tons.	1911. Tons.	1912. Tons.	1913. Tons.
Argentina	918,413	654,299	442,982	515,400	1,016,732
Uruguay[1]	—	16,776	22,317	33,073	24,451
India	233,859	370,552	522,023	354,490	413,874
Russia	96,064	140,885	158,064	164,419	107,074
Canada	16,363	47,114	63,587	34,989	235,435
United States	20,823	1,537	23	102	391
China	—	—	—	22,491	9,904
Total	1,285,522	1,231,163	1,208,996	1,124,964	1,807,861

[1] *Export figures are not available, so the whole output is taken as exported.*

The average annual exported surplus during the five years 1909–13 was therefore 1,331,701 tons, of which India contributed 29 per cent.

Chief Linseed-importing Countries

The imports of linseed into the chief linseed-importing countries of the world during the years 1909–15 are shown in the following table:

Year.	United Kingdom. Tons.	France. Tons.	Belgium. Tons.	Germany. Tons.	Holland. Tons.
1909	314,338	170,256	266,845	436,867	247,267
1910	281,158	141,736	200,096	320,522	191,484
1911	258,125	119,118	235,892	276,343	171,166
1912	264,170	151,905	223,032	330,092	208,929
1913	606,308	251,402	259,104	560,323	286,034
1914	454,033	133,656	—	—	—
1915	393,779	37,181	—	—	—

The following table shows the relation which these imports bear to the world's exportable surplus as estimated above;

Year.	World's exportable surplus.	Proportion of the world's exportable surplus represented by the imports into				
		United Kingdom.	France.	Belgium.[1]	Germany.	Holland.
	Tons.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1909 .	1,285,522	24·5	13·2	16·5	34·0	19·2
1910 .	1,231,163	22·8	11·5	11·5	26·0	15·6
1911 .	1,208,996	21·4	9·9	13·5	22·9	14·2
1912 .	1,124,964	23·5	13·5	12·7	29·3	18·6
1913 .	1,807,861	33·5	13·9	8·6	31·0	15·8

[1] *Corrected for re-exports to Germany.*

Italy, Austria-Hungary and Australia each import about 40,000 tons per annum.

The following table shows the percentages of the imports of linseed into the United Kingdom derived from the chief contributing countries :

Imports of Linseed into the United Kingdom

(A) QUANTITIES

From	1912. Tons.	1913. Tons.	1914. Tons.	1915. Tons.	1916. Tons.
Russia . . .	48,155	18,379	21,163	2,659	12,607
Argentina. . .	71,825	208,679	190,299	235,951	169,180
India . . .	118,377	126,472	205,265	147,329	280,438
Canada . . .	1,801	236,606	20,995	145	323
Total from all countries	264,170	606,308	454,033	393,779	462,548

(B) PERCENTAGES

	1912.	1913.	1914.	1915.	1916.
Russia . . .	18·2	3·0	4·7	0·7	2·7
Argentina. . .	27·1	34·4	41·9	60·0	36·3
India . . .	44·8	20·8	45·2	37·4	60·2
Canada . . .	0·7	39·0	4·6	0·0	0·1
Total from above countries	90·8	97·2	96·4	98·1	99·3

Canada's production and export of linseed have fluctuated greatly. The United States is the chief destination of Canada's exports. The export of linseed from Russia to be expected in the future may be reckoned at about 100,000 to 150,000 tons a year, whereas Argentina is apparently capable of producing for export 1,000,000 tons and upwards.

The average contribution of linseed from India to the United Kingdom in the five years 1912–16 was over 41 per cent. of the total imports.

It does not seem likely that the linseed-producing countries of the Empire will in the near future provide more than 50 or 60 per cent. (40 from India, 10–20 from Canada) of the requirements of the United Kingdom, assuming the latter to be about 520,000 tons per annum. Russia should be able to provide from 20,000 to 50,000 tons a year. The remainder will have to be obtained from Argentina, and in view of large British investments there it seems likely that considerable quantities will be obtained from Argentina.

Cultivation of the flax plant for seed has given encouraging results in British East Africa, but in view of the preoccupation of East Africa with flax fibre, seed is not likely to be produced in quantity there. Japan is another country in which the production of flax and possibly of linseed may make rapid progress.

Trade of India

The export of linseed from India was first recorded in 1832, when 3 cwts. were exported. In 1850 the exports amounted to 28,000 tons, in 1880–1 to 299,000 tons, and the high-water mark was reached in 1904–5 with 559,000 tons. At one time India held the dominant position in the world's trade in linseed, but now Argentina is the largest producer, and the United States of America, Canada and Russia all turn out large crops.

The Indian exports are, however, still of great importance in the world's linseed trade, forming nearly 30 per cent. of the exportable surplus of the world.

Linseed is sown either by itself in India or as a mixed crop. The estimates of the outturn of linseed from pure and mixed crops for the years 1911–12 to 1916–17 were :

	1911–12.[1] *Tons.*	1912–13.[1] *Tons.*	1913–14. *Tons.*	1914–15. *Tons.*	1915–16. *Tons.*	1916–17. *Tons.*
Pure .	502,000	410,600	327,200	287,000	346,000	382,000
Mixed .	140,000	128,000	59,000	110,000	130,000	138,000

[1] *Excluding Punjab, which in subsequent years produced from* 3,000 *to* 4,000 *tons.*

The exports of linseed from India in recent years are shown in the following table :

Exports of Linseed from India

		1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Total quantity .	*tons*	522,023	354,489	413,874	321,577	192,987	394,103
„ value .	£	8,643,277	5,318,383	4,457,998	3,502,411	1,982,782	4,759,957
To		*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .		154,931	110,316	157,315	206,109	144,755	308,968
Australia . .		877	2,605	3,360	3,417	7,389	10,550 [1]
Total, British Empire		158,422	113,040	160,855	211,014	152,383	— [2]
Belgium . . .		119,990	83,821	38,459	24,418	—	—
France . . .		80,832	70,192	115,460	39,716	18,848	47,254
Italy . . .		30,060	25,607	30,657	31,137	12,180	22,582
United States . .		68,481	8,688	—	—	900	2,766
Germany [3] . .		40,159	33,171	48,326	10,053	—	—
Austria-Hungary [4] .		8,268	5,186	6,500	891	—	—
Holland [5] . .		13,162	11,278	9,576	1,149	—	—

[1] *Including New Zealand.* [2] *Figure not available.*

[3] *Germany imported considerable amounts of linseed from Belgium and Holland, some of which may have been of Indian origin. The figures given in the German Trade Returns for direct imports from India are much in excess of those in this table.*

[4] *The direct imports from India to Austria-Hungary shown in the Austro-Hungarian returns are in excess of these figures.*

[5] *Holland imported considerable quantities of linseed from Belgium, some of which may have been of Indian origin.*

It will be seen that in the pre-war years the bulk of India's trade in linseed was with the Empire and Allied countries. A large part, however, of the imports to Belgium went to Germany. In normal times about 80 per cent. of the Indian crop is exported.

Linseed Oil

A certain quantity of linseed is crushed in India. The oil obtained is said not to be equal to that manufactured in the United Kingdom, and railways and other large consumers of linseed oil find it necessary to import their requirements.

Exports of Linseed Oil from India

Year.	Quantity. *Gallons.*	Value. £
1910–11 . .	316,111	42,594
1911–12 . .	249,975	49,966
1912–13 . .	106,867	20,823
1913–14 . .	102,360	17,493
1914–15 . .	132,796	27,869
1915–16 . .	280,850	47,274
1916–17 . .	178,257	32,829

Two-thirds of this trade is with countries in the British Empire—Hong Kong, Australia and New Zealand being the principal customers. In 1914–15 the United Kingdom took 29,000 gallons valued at £13,000, and in 1915–16 17,000 gallons valued at £8,000.

Imports of Linseed Oil into India

Year.	Quantity. Gallons.	Value. £
1910–11	342,067	50,919
1911–12	399,070	64,845
1912–13	364,961	56,401
1913–14	439,482	58,817
1914–15	360,484	49,781
1915–16	267,687	43,535
1916–17	134,922	29,570

The United Kingdom supplies practically the whole of the linseed oil imported into India. Although, as mentioned above, Indian linseed oil is said to be inferior to that manufactured in the United Kingdom, yet the value per gallon declared at time of export of the Indian oil is higher than the declared value of the British oil at time of import in India. The average value per gallon of the Indian produce at time of export in 1913–14 and 1914–15 was 3*s.* 5*d.* and 4*s.* 2*d.* respectively, whereas the value of linseed oil imported from the United Kingdom was 2*s.* 8*d.* and 2*s.* 9*d.* respectively for the same periods. The difference in value is extraordinary when it is remembered that freight and other charges have been paid on the imported oil.

Other Products of the Flax Plant

Linseed Cake.—The Indian returns do not show the export of this cake separately.

Fibre.—The plant is grown in India practically for linseed only, though trial cultivations for fibre have been made. The value of raw flax fibre and manufactures exported from India for the last five years averages less than £2,000 per annum. The imports of raw flax and manufactures on private and Government account averaged in value over £270,000.

General Remarks

It seems clear from the foregoing that there would be no difficulty about finding a market in the Empire for the whole of the linseed exported from India. It is not possible to determine precisely how much of India's exports of linseed went to Germany and Austria-Hungary, because there were direct and indirect imports, but it certainly did not on the average exceed 75,000 tons, which is about 16 per cent. of India's average export. On the contrary, the United Kingdom alone could take the whole of India's output, whilst there are probably considerable opportunities for an extension of the market for linseed (or linseed oil and cake) in Australia, New Zealand and the Union of South Africa. Australia is already a much better market than Austria-Hungary. The total market in the United Kingdom is much larger than appears on the surface, as the following figures show :

Average Annual Imports of Linseed (Raw and Semi-manufactured) into the United Kingdom during the five Years 1911–15

	Tons.
1. Net average annual imports of raw linseed, *i.e.* imports less re-exports	384,568
2. Net average annual imports of linseed oil (*i.e.* imports less re-exports) expressed in terms of raw linseed, linseed oil being taken as 35 per cent. of raw linseed	43,223
3. Net average annual imports of linseed cake (*i.e.* imports less re-exports) expressed in terms of raw linseed, cake being taken as 65 per cent. of raw linseed	93,419
Grand total	521,210

Allowing for the excess of cake from item 2, and the excess of oil from item 3, the net requirements annually in the years mentioned must have been about 460,000 tons.

Niger Seed

The plant which produces the niger seed of commerce is known botanically as *Guizotia abyssinica*. It is native to tropical Africa, but is now cultivated in various parts of India, whence the bulk of the European supply is derived. The imports of niger seed into the United Kingdom and Germany are not separately recorded

in the official returns of trade, and it would therefore appear that the trade is of small importance. The figures given in the official returns of imports into France do not correspond with those given in the Indian returns; thus the French imports from India for the four years 1911 to 1914 averaged 2,260 metric tons, whilst the exports to France from India averaged 1,547 tons for the same period.

The following table shows the quantities and distribution of the niger seed exported from India during recent years:

Exports of Niger Seed from India

	1911-12.	1912-13.	1913-14.	1914-15.	1915-16.
Total quantity *tons*	10,105	5,684	4,107	2,330	589
" value . £	102,650	57,843	42,926	22,154	4,823
To	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .	5,176	1,649	367	1,660	381
France . .	2,780	2,357	1,046	5	10
Italy . . .	747	1,003	50	26	175
Germany . .	1,151	247	2,029	590	—
Austria-Hungary .	199	399	566	—	—

In India, niger seed is produced chiefly in Chota Nagpur, the Central Provinces and the Deccan. In some parts of India it is known as kala-til (*i.e.* black til or sesame), and like sesame it is generally sown in July or August and cut in November or December. Apparently no official forecast is prepared showing the extent of the cultivation and the estimated yield.

It is largely sown as a mixed crop, and the outturn per acre depends on the proportion of the seed sown. In Chota Nagpur the average yield per acre was estimated at 330 lb. In 1885-6 it was estimated that 250,000 acres were devoted to niger seed in the Central Provinces. The export trade has never been on a large scale, and is not on the increase.

Niger seed yields a pale yellow oil, with little odour and a sweet taste. Comparing niger seed with rape seed the yield of oil is about 16 gallons per quarter against 20 gallons, and the average weight of the seed is about 8 lb. per bushel less than that of rape seed, which is an important question when estimating freight charges. The relative Indian export values of niger, sesame and rape seeds for the last five years were as follows:

Value per Ton

	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.
	£ s.	£ s.	£ s.	£ s.	£ s.
Niger seed	9 16	10 3	10 3	10 9	9 12
Sesame seed	13 3	14 5	15 12	16 0	15 4
Rape seed	9 8	10 0	11 0	11 9	11 2

Niger seed is largely crushed in India for the oil, which is used principally for cooking, anointing the body and for lighting, and, owing to its comparative cheapness, to some extent as an adulterant of sesame and other more valuable oils. In its drying properties the oil ranks between cotton-seed and linseed oils. The cake which is left after the oil has been removed from the seed is used for cattle feeding in India and Europe.

The following analyses show the average composition of five samples of niger-seed cake compared with that of sesame cake of English and Burmese manufacture. The analyses of the niger-seed cake and the English sesame cake were made at the East Anglian Institute of Agriculture, Chelmsford; that of the Burmese sesame cake is quoted from "The Valuation of Feeding-Stuffs," by Alfred Smetham (*Journ. Roy. Lancs. Agric. Soc.* 1914).

	Sesame cake.		Niger cake
	Burmese manufacture.	English manufacture.	(average of five samples).
	Per cent.	*Per cent.*	*Per cent.*
Moisture	7·20	9·3	10·4
Fat	17·80	11·9	6·1
Protein	35·88	44·5	33·1
Starch, etc. (by difference)	22·44	20·9	23·4
Woody fibre	4·43	4·5	16·8
Mineral matter (ash)	12·25	8·9	10·2
Food units[1]	156	162	121
Nutrient ratio[2]	1 : 1·76	1 : 1·09	1 : 1·13

[1] *The food unit is the total obtained by adding the percentage of starch to 2·5 times the sum of the percentages of fat and crude proteins.*

[2] *The nutrient ratio is the ratio between the percentage of crude proteins and the sum of the percentages of starch and fat, the latter being first converted into its starch equivalent.*

It will be seen that the trade in niger seed is of small importance, and there is little likelihood that the cultivation of the plant will be extended in India, as sesame, which is grown in the same localities, gives a better return. It should be possible for British oil-seed crushers to secure and utilise the small quantities of Indian niger seed which were formerly taken by Germany and Austria-Hungary.

RAPE (COLZA, RAVISON, TORI) AND MUSTARD SEED

The name rape seed, with its synonyms colza and ravison, is applied to the seed of a great number of varieties of *Brassica campestris* (with perhaps allied species), a plant nearly allied to the turnip and cabbage, which is widely grown in temperate, sub-tropical and tropical countries either for use as a green fodder or for the production of seed. True rape seed is liable to be confused with mustard seed (as in India and China), with wild rape or ravison, and with the so-called Indian rape seed (teora, tori, taramani or jamba) obtained from *Eruca sativa*. It is therefore convenient to discuss all these seeds together, and in this connection it should be noted that some of the statistics given in this statement may relate to pure and genuine rape seed and others to mixtures with mustard, ravison and tori seeds, but where such admixture is known the fact will be mentioned.

India, Russia and China produce most of the world's supply of rape seed, but Roumania, Bulgaria, the Dutch Indies and Argentina also make contributions to the exportable surplus. The plant is cultivated in many other countries both for seed and as green fodder.

The following table, taken from the *Annuaire International de Statistique Agricole*, 1913 *et* 1914, gives the production of rape seed in the principal producing countries of the world :

Production of Rape Seed in the Chief Producing Countries

	Average for the five years 1905–9.	1910.	1911.	1912.	1913.	1914.
	Metric tons.	*Metric tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*
India (pure) .	562,402	764,474	682,987	710,725	694,773	727,388
„ (mixed) .	365,370	473,478	570,002	618,773	559,842	322,247
Japan . .	131,179	125,766	126,057	122,612	108,882	—
Roumania .	48,774	91,535	41,878	36,275	51,814	38,574
France . .	48,027	47,531	41,930	29,951	—	—
Austria . .	30,337	21,164	18,159	17,259	13,832	—
Hungary . .	18,860	28,890	28,059	—	—	—
Bulgaria . .	6,917	2,272	14,463	14,657	—	—
Netherlands .	5,386	4,153	3,604	1,177	3,064	3,773
Belgium . .	1,373	1,268	1,379	1,433	1,595	—

This table is incomplete, as it does not include Russia, Argentina and China, all of which countries are producers and exporters of rape seed.

Russia.—A large quantity of wild rape or ravison grows in the north of Russia. The rape plant proper is extensively cultivated in Bessarabia and Southern Russia, and the seed is exported from Odessa and other Black Sea ports. More than half the trade, however, goes overland across the Western frontier to the Central European countries.

The following table shows the quantities and chief destinations of rape seed exported from Russia during the years 1913 and 1914:

Exports of Rape Seed from Russia

	1913. *Tons.*	1914. *Tons.*
Total quantity	59,021	27,855
To United Kingdom	19,622	15,368
Belgium	5,801	2,758
Holland	10,384	2,590
Austria-Hungary	5,229	393
Germany	15,945	5,826

Roumania.—Roumania produces a large quantity of rape seed known as "navette," and exports between 30,000 and 40,000 tons a year. The seed exported is classed as colza and goes principally overland to Germany, Austria-Hungary and Belgium.

Argentina.—The rape plant is cultivated in Argentina, and small quantities of the seed, classed as "turnip seed," are exported to Europe.

China.—China has exported rape seed in recent years. In 1912 the exports from Tientsin alone amounted to over 14,000 tons, and in the British Consular Report for that year the trade was referred to as new. The following table gives the exports from China for three years:

Exports of Rape Seed from China

	1913. *Tons.*	1914. *Tons.*	1915. *Tons.*
Total quantity	36,708	52,120	64,978
To Japan	16,448	26,889	61,663
France	9,268	12,785	—
Great Britain	4,562	6,712	949
Belgium	2,000	1,334	—
Italy	982	2,137	—
Germany	658	400	—
Austria-Hungary	2,282	797	—
Other countries	508	1,066	2,366

This trade will probably increase if the price of oil seeds remains high. Japan has secured a large share of the trade, and in this connection it is noteworthy that in 1915 and 1916 the United Kingdom imported from that country rape-seed oil to the value of £231,624 and £251,551 respectively.

The following table shows the quantities and principal countries of origin of the rape seed imported into the chief rape-seed importing countries in Europe :

Imports of Rape Seed to Chief Consuming Countries

To	1910. *Metric tons.*	1911. *Metric tons.*	1912. *Metric tons.*	1913. *Metric tons.*	1914. *Metric tons.*	1915. *Metric tons.*	Principal countries of origin.
Germany	187,302	134,480	125,684	153,427	—	—	India, Roumania
France	97,761	84,996	71,517	55,359	41,428	13,779	India
United Kingdom [1]	46,540	42,999	34,679	49,178	57,267	35,618	India, Russia
Belgium [2]	46,780	36,198	33,897	37,294	—	—	India, Roumania
Italy	—	6,702	3,209	10,182	21,980	—	India

[1] *Long tons.* [2] *Corrected for re-exports, which were sent chiefly to Germany.*

It will be seen from the above table that India as the chief producer is the principal source of the rape seed imported into European countries, and that before the war Germany was the most important market, followed by France, the United Kingdom and Belgium.

Indian Rape Seed

Many varieties of the plant are cultivated in India, but the three main varieties are sarson (Indian colza), tori (Indian rape, *Eruca sativa*), and rai (Indian mustard, *Brassica juncea*) (*Agric. Ledger*, No. 1, 1898). The crop is largely grown in the northern tracts of India, sometimes pure, but more often mixed with other crops. It is sown in October and November and cut in February and March. It is estimated that on an average over 6,000,000 acres, including the mixed crops of the United Provinces, are cultivated, of which the United Provinces contribute about 40 per cent., Bengal 22 per cent., Punjab 19 per cent., and Bihar and Orissa 10 per cent. The average yield is under

4 cwts. per acre; this does not, however, represent the outturn obtained when rape is sown as a pure crop.

The species most commonly grown in the United Provinces and the Punjab is sarson (Indian colza), producing white, yellow or brown seeds; tori (Indian rape), with smaller seeds of a bright brown colour, is also grown in these two Provinces, and more extensively in Bengal and Bihar. Rai (Indian mustard), with small brown seeds, is extensively cultivated in Bengal and to a less extent in the other Provinces; the seeds of this species are hard and yield less oil than the other kinds.

The seeds most largely exported from India are those obtained from sarson (either yellow or brown) and from tori (brown), and grown in the United Provinces and the Punjab. The following table shows the quantities exported from the various Indian ports for two years, and also the provincial production of seed for the same periods:

Exports

Port.	1912–13. Tons.	1913–14. Tons.
Calcutta	800	7,800
Bombay	52,600	52,200
Karachi	164,400	188,900

Production

Province.	1912–13. Tons.	1913–14. Tons.	
Bengal	265,800	266,200	Provinces served by the Port of Calcutta
Bihar and Orissa	137,100	165,700	
Assam	58,400	61,300	
Punjab	156,600	165,000	Served by Karachi.
Sind[1]	4,600	42,000	
North-West Frontier Province	7,200	15,900	
United Provinces	584,900	35,000	Served partly by Bombay and partly by Karachi.
Bombay[1]	20,000	21,300	Served by Bombay only.

[1] *Including Native States.*

From the above statements it seems that the seed grown in Bengal, Bihar and Assam is that chiefly retained for local consumption. On an average the total annual outturn of seed in India is 1,200,000 tons, and in normal years the proportion of exports to total production is about 20 per cent.

It would appear, from various notes which have been

written on the Indian plant, that the seed has deteriorated in several localities, and that there now exist many cross-bred types. There is evidently much room for improvement, and larger outturns may be expected when the Indian Agricultural Departments have been able to deal more fully with the question of the change and selection of seed.

Summary of the Trade in Rape Seed

The Indian Trade Returns show that before the war India exported annually about 260,000 tons of rape seed; Germany was the most important market, followed by France, the United Kingdom and Belgium. Considerable quantities were also taken from India by Holland *via* Belgium. Details of the exports from India to the chief countries of destination in recent years are shown in the following table:

Exports of Rape Seed from India

	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Total quantity *tons*	329,653	235,477	217,829	249,005	96,912	95,214	121,748
Total value	£3,104,296	2,341,384	2,403,453	2,851,711	1,083,719	938,576	1,180,108
To	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom	40,782	19,229	21,395	14,099	24,681	47,474	88,991
Total, British Empire	40,820	19,262	21,454	14,419	24,820	47,696	—[1]
Belgium[2]	92,685	100,586	82,509	98,869	26,861	—	—
France	79,471	60,113	53,144	53,943	20,593	40,280	23,426
Italy	7,788	5,879	2,913	13,727	14,758	6,375	4,759
Germany	92,993	40,596	54,712	58,199	8,107	—	—
Austria-Hungary	6,189	4,027	1,247	5,472	700	—	—
Holland	4,989	4,354	1,550	3,824	—	—	—
Spain	1,243	409	250	550	1,060	700	—[1]

Average exports, 1910–11 to 1913–14, 258,000 tons.
" " 1914–15 to 1916–17, 104,628 "

[1] *Figures not available.* [2] *Much of this eventually goes to Germany.*

According to the German Trade Returns Germany imported annually on the average 150,223 metric tons of rape seed during the years 1910–13 and re-exported 7,077 tons, giving 143,146 tons as the average annual consumption. Of this India supplied on the average 83 per cent., Roumania coming next with an average of 10½ per cent.

Germany's net imports of Indian rape seed before the war were therefore equal to about 55 per cent. of the total Indian exports.

The total imports of rape seed, mustard seed, and ravison seeds into France during the years 1911 to 1914 averaged 63,325 tons and the re-exports 2,366 tons, leaving 60,959 tons as the average annual home consumption. This is roughly equivalent to 30 per cent. of the average total Indian exports during the same four years. India's share in the French imports of rape seed amounted to 85 per cent.

The Belgian Trade Returns indicate that the rape-seed trade of Belgium was largely transit trade to Germany and Holland, the average amount retained for consumption in the years 1910–13 being only 38,542 tons, of which 73 per cent. may be estimated as of Indian origin, assuming that Indian rape seed was retained for consumption in the same proportion as imported.

The quantity of rape seed retained for consumption in the United Kingdom was in the years 1911–14 on the average 44,543 tons, of which India contributed 18,808 tons or 41 per cent. The United Kingdom is, however, also a considerable importer of rape-seed oil and cake, and allowance should be made for this in estimating the home market. Before the war the United Kingdom took as much seed from Russia as from India.

Rape-seed Oil

The amount of oil in rape seed varies somewhat widely according to the variety of plant and the locality in which it is grown, the extreme range being from about 33 to 45 per cent. According to Lewkowitsch (*Technology of Oils, Fats and Waxes*) seed from the north of France contains 43 to 45 per cent., Danubian seed 38 to 40 per cent., and Indian seed 42 to 45 per cent. The commercial yield of oil may be taken as 36 per cent.

In spite of the number of varieties of plants which furnish seed used as sources of rape-seed oil, the character and analytical data of the oils do not differ to any great extent.

Rape-seed oil is growing in importance as an edible oil, as it can now be so refined as to make it suitable for use in the manufacture of margarine. In 1913 it was estimated that Germany used 478,000 gallons and Holland 239,000 gallons of colza oil for margarine.

Trade in Rape-seed Oil. Exports

The principal countries that export rape-seed oil are Germany, the United Kingdom, France, Japan and India. The quantities of the exports from these countries are shown in the following table:

Exports of Rape-seed Oil

From	1910. *Gallons.*	1911. *Gallons.*	1912. *Gallons.*	1913. *Gallons.*	1914. *Gallons.*	1915. *Gallons.*	1916. *Gallon*
United Kingdom	1,227,636	1,507,815	1,331,397	1,418,877	1,659,690	1,470,150	953,26
Germany	2,139,050	1,371,382	540,857	989,460	—	—	—
France	—	561,650	387,658	418,087	407,168	170,198	137,20
Belgium [1]	—	488,899	429,244	— [2]	—	—	—
Japan	—	—	603,577	1,261,025	1,414,260	—	—
India [3]	378,978	377,824	377,563	406,890	426,956	459,458	552,11

[1] *Net exports.* [2] *Not shown separately.* [3] *Rape and mustard oil.*

India exports on the average about 400,000 gallons of rape-seed oil (including mustard-seed oil), almost all of which goes to British countries, the chief importers being Mauritius and Natal, which together take on the average 72 per cent. of the total. Large quantities are also sent to British Guiana and Fiji. Details of the exports from India are shown in the following table:

Exports of Rape-seed Oil and Mustard-seed Oil[1] from India

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17
Total quantity . galls.	364,228	414,217	407,178	413,189	465,735	574,32
„ value . £	43,707	51,554	48,624	49,594	51,017	65,97
To	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	
United Kingdom	7,162	43,075	8,580	6,261	699	Figures not available.
Mauritius	161,343	178,192	189,651	205,989	220,977	
Natal	105,289	98,929	94,916	98,954	131,992	
British Guiana	16,565	26,270	31,267	20,727	23,525	
Fiji	43,989	40,366	41,329	47,782	22,570	
Straits Settlements	10,121	13,205	15,665	12,171	12,631	
Total British Empire	356,255	409,104	397,351	406,767	443,856	

[1] *The amount of mustard-seed oil is known to be small.*

The exports of rape-seed oil from Germany were on the whole declining before the war, due no doubt to use

of the oil in Germany. The exports to the United Kingdom show a great falling-off during the years 1910 to 1913. Taking the average amount of rape seed retained in Germany for consumption as 143,146 tons, and the average export of rape-seed oil as 1,260,187 gallons (5,273 metric tons) and assuming that the seed yields 36 per cent. of oil, 14,647 tons or 10¼ per cent. of the seed worked in Germany is required for the export trade in oil, and of this 3,520 tons or 24 per cent. represents oil sent to the United Kingdom.

The United Kingdom exports a little less rape-seed oil (of home manufacture) than she imports, the average excess of imports over re-exports and exports for the years 1911 to 1915 being 416,405 gallons. There is obviously a considerable opening for India or the United Kingdom to secure Germany's export trade in rape-seed oil.

The United States imports considerable quantities of rape-seed oil, chiefly from the United Kingdom, France coming next and probably Germany next when allowance is made for Germany's share of the exports credited to Holland and Belgium.

Of the shipments of rape-seed oil from Japan in 1912 and 1913 the British Empire took 79 per cent., including Great Britain 51 per cent. This oil is expressed largely from seed imported from China, and there seems to be no reason why India should not compete to a greater extent for this trade. The Indian exports of oil have remained almost stationary, whereas those of Japan have increased rapidly.

Rape-seed Cake

The following table shows the quantities and countries of origin of the rape-seed cake imported into the United Kingdom :

	1911.	1912.	1913.	1914.	1915.	1916.
Total imports *tons*	51,091	16,606	28,882	37,421	7,755	734
„ value . £	212,704	85,889	156,592	184,092	47,623	7,141
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
From British Possessions . .	244	120	23	250	496	—
Russia . . .	43,481	14,293	25,839	34,455	—	—
France . . .	—	—	—	—	1,459	—
Argentina . .	658	151	241	1,455	4,573	307
Other countries .	6,708	2,042	2,779	1,261	1,227	427

Practically the whole of the rape-seed cake imported into and produced in the United Kingdom is consumed in this country ; it is not possible to say how much goes into compound cattle cakes, and how much is used as manure. The cake is a favourite manure for potatoes and root crops, and as a top dressing for wheat and barley. Rape-seed meal, from which the oil has almost entirely been extracted by solvents, is largely used for manurial purposes, especially by hop growers.

The cake is largely used on the Continent as a feeding-stuff for cattle, but in the United Kingdom there is a prejudice against it, due it is stated to the adulteration to which the seed has been subjected, and to the risk attaching to its use owing to the frequent presence in it of mustard seed. These complaints are made more commonly against cake from Indian seed than against that made from Russian seed. The cake has a somewhat pungent and bitter taste which is said to be disliked by cattle, but not by sheep.

The following typical analyses of rape-seed cake are taken from "The Valuation of Feeding-stuffs" by Smetham (*loc. cit.*). Analyses of linseed cake are added for comparison :

Name.	Water.	Oil.	Albuminoids.	Digestible carbo-hydrates.	Woody fibre.	Mineral matters.	Sand and silica.	Food units.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	
Rape-seed cake—								
Punjab	7·75	13·27	37·25	28·46	5·90	7·37	2·15	155
Bessarabia	8·10	12·27	33·13	27·32	9·83	9·35	4·15	141
Brown E. Indian extracted	12·01	3·10	35·12	33·00	8·47	8·30	1·80	128
Brown colza cake, Cawnpore	6·55	6·87	35·63	34·15	6·30	10·50	2·75	140
Ravison cake	7·30	7·10	33·12	29·16	12·27	11·05	4·90	130
„ „ Dnieper.	8·70	12·13	36·75	30·29	6·78	5·35	0·90	152
For comparison.								
Linseed cake, English made, average	11·16	9·50	29·50	35·54	9·10	5·20	0·60	133
Linseed cake, Bombay	9·60	10·32	30·83	33·86	8·22	7·17	1·92	137
„ „ Calcutta	9·25	9·83	33·25	34·82	5·70	7·15	2·20	142
„ „ Galatz	10·75	9·53	37·25	29·51	8·16	4·80	0·15	146
„ „ Russian	11·70	9·70	35·25	30·35	7·70	5·30	0·60	143

General Remarks

Taking the average annual export of rape seed from India before the war as 260,000 tons, Germany, France, Belgium and the United Kingdom divided this supply among them in about the following proportions : Germany 40 per cent., France 24 per cent., Belgium 11 per cent., United Kingdom 7 per cent., leaving for other countries about 18 per cent. The only country which could clearly increase its imports from India considerably is the United Kingdom, which took large amounts of rape seed and rape-seed cake from Russia and of rape oil from Germany. Apart from this there is not much chance of finding a market for the Indian rape seed which used to go to Germany, unless it finds a new outlet in the United Kingdom, Holland, Scandinavia and France, especially for the production of edible oil, either in the refined form or after conversion into a solid fat by hydrogenation.

Indian Mustard Seed

The Indian trade statistics show the export of mustard seed separately ; the average quantity exported is about 4,000 tons. In 1913–14 the average export value of mustard seed was 13*s*. 10*d*. per cwt. as compared with 11*s*. 6*d*. per cwt. for rape seed. The bulk of the exports go from Bombay, and France is the chief customer.

The following table gives details of quantities and the chief countries of destination of the exports of mustard seed from India :

Export of Mustard Seed from India

	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Total quantity *tons*	3,968	4,432	3,653	5,104	2,553	3,178	6,074
Total value . £	71,585	77,180	60,580	70,724	40,400	55,778	116,977
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .	24	52	6	900	10	170	Figures not available.
Ceylon . .	139	168	263	312	177	205	
Total to British Empire . .	242	318	359	1,295	298	489	
Belgium . .	764	923	676	1,029	355	—	
France . . .	2,081	2,375	1,723	2,384	1,568	2,512	
Germany . .	433	530	780	328	170	—	

POPPY SEED (*Papaver somniferum*)

The poppy is extensively cultivated for opium in Macedonia (especially in the Salonica district), Asiatic Turkey, Persia, India and China; in all these countries the seed forms, however, a valuable secondary crop. In many parts of Europe a form of poppy is cultivated solely for the sake of the oil-bearing seeds. The term maw-seed, probably a corruption of the German " mohr," is applied to the dark or " blue " seed of the poppy grown in Europe. The name is usually associated with the poppy seed used for feeding birds.

The world's production of poppy seed is difficult to estimate, as some of the producing countries do not publish full details. Some idea of the quantities entering the European markets may, however, be formed from the following tables which show the imports into France and Germany, the two most important countries utilising poppy seed, and the exports from India, which is the chief producing country:

Imports of Poppy Seed into France

	1911. Metric tons.	1912. Metric tons.	1913. Metric tons.	1914. Metric tons.	1915. Metric tons.
Total imports	19,479	18,015	9,021	6,935	4,173
From					
India	18,848	15,718	8,206	6,526	
Turkey	196	2,296	768	348	
Other countries	435	1	47	61	

Imports of Poppy and Sunflower[1] Seed into Germany

	1910. Metric tons.	1911. Metric tons.	1912. Metric tons.	1913. Metric tons.
Total imports	19,759	26,713	16,403	20,586
From				
Russia	2,496	5,771	5,867	8,575
Turkey	3,130	3,814	2,183	2,428
India, etc.	13,211	13,489	7,178	8,887
China	284	1,609	520	99
Other countries	638	2,030	655	597

[1] *Separate figures for imports of poppy seed into Germany are not shown in the German Trade Returns. The imports of sunflower seed are, however, probably merely those from Russia shown in this table.*

Exports of Poppy Seed from India

Principal countries of destination.	1911–12. Tons.	1912–13. Tons.	1913–14. Tons.	1914–15. Tons.	1915–16. Tons.	1916–17. Tons.
United Kingdom .	—	—	—	84	143	—[2]
France . .	19,400	17,800	10,700	4,175	6,635	5,253
Belgium[1] . .	10,200	2,900	4,800	1,360	—	—
Germany . .	4,560	2,400	3,300	960	—	—
Total exports .	34,943	23,402	18,980	6,992	6,872	5,524

[1] *Probably largely re-exported to Germany.* [2] *Figure not available.*

In 1914–15 Italy took about 350 tons of Indian seed. France is the chief consumer and under normal conditions should be able to absorb the whole of the available supplies from India. Poppy seed is not shown separately in the China trade statistics, but the quantity available for export is probably small. In 1910 Germany took the whole of the exports from Salonica (about 4,000 tons), but the exports were then on the decline, on account of the increase in local consumption. Asiatic Turkey and Persia must produce large quantities of poppy seed. Since the outbreak of the war Germany has probably secured all the poppy and sesame seed grown in the Turkish Empire. India annually imports from 1,000 to 4,000 cwts. of poppy seed from Persia. This is classed under the heading " Imports for Home Consumption."

In 1903–4 the estimated area under poppy in India was 769,000 acres, but since then the area has been considerably curtailed on account of agreements with the Chinese Government in 1907 and 1911 for the gradual extinction of the export of Indian opium to China. The production of " Bengal " opium, under State control, is now restricted to the United Provinces, and the average area under poppy cultivation for the last five years was 186,715 acres. As the export of " Malwa " opium is now prohibited it is probable that the large areas, formerly under poppy, in Rajputana and Central India, have been devoted to other crops. The bulk of the seed hitherto exported from India was the produce of the poppies cultivated in British India, the Malwa poppy seeds being largely retained for local consumption.

The average yield of poppy seed in the United Pro-

vinces is estimated to be 5 to 6 maunds of 82 lb. each per acre. Taking the average outturn at 4 cwts. per acre, the following statement shows the estimated area under poppy in British India, the yields of poppy seed, the quantities exported and the average export values over a series of years :

Year.	Area under cultivation in British India.	Estimated yield.	Quantity exported.[1]	Average export value per ton.	
	Acres.	*Tons.*	*Tons.*	£	s.
1904–5 . .	612,000	122,400	65,800	7	4
1910–11 . .	383,000	76,600	43,400	13	6
1911–12 . .	220,000	44,000	34,900	14	4
1912–13 . .	197,000	39,400	23,400	15	16
1913–14 . .	170,000	34,000	19,000	16	7
1914–15 . .	179,000	35,800	7,000	13	4
1915–16 . .	181,000	36,200	6,900	11	6

[1] *Includes the seed obtained from the "Malwa" opium crop, of which certain quantities were exported.*

The above statement shows that the quantity of seed now available for export is limited. The average area under poppy for the last five years was about 189,000 acres, and if this acreage is maintained in the future the annual yield, at 4 cwts. per acre, will amount to 37,800 tons.

The seed obtained from the ripe capsules (after the removal of the drug) has a sweet taste, and is eaten in India, being largely employed in the manufacture of sweetmeats. The seeds from unripe capsules are said to be bitter and narcotic, and the oil extracted is also bitter.

A form of poppy is cultivated in France and other European countries, and the oil from these seeds is known as "huile d'œillette"; the oil obtained from the Indian and Turkish seed is known as "huile de pavot." In France the seed is usually pressed in the mills which also crush sesame seed, so that the oil often contains traces of sesame oil.

The residue, or cake, left after the oil has been pressed from the ripe seed is sweet and nutritious and used as a food for bullocks and sheep, but is not recommended for young stock or cows. It is said not to keep well and to be liable to become mouldy and acrid to the taste, and is alleged then to be more or less injurious to cattle.

The following analyses of poppy-seed cake and meal

are taken from Smetham (*Journ. Roy. Lancs. Agric. Soc.*, 1914):

	Cake. Per cent.	Meal. Per cent.
Water	10·15	9·95
Albuminoids	35·38	39·50
Oil	11·43	12·13
Digestible carbohydrates	20·04	16·24
Woody fibre	7·90	9·43
Mineral matter	15·10	12·75

GROUND-NUTS

The following table shows the exports of ground-nuts from the principal producing countries of the world during the year 1913:

Exports from British countries.	Total exports. Metric tons.	Exports to France. Metric tons.
India	259,704	200,977
Gambia	68,935	42,826
Nigeria	19,639	531
Nyasaland	1	—
Sudan	719	—
Total	348,998	244,334
Exports from other countries.		
Senegal	229,962	165,973
French India [1]	107,238	88,792
China	69,178	21,230
Netherlands East Indies	20,141	7,509
Portuguese East Africa	3,467	—
Total	429,986	283,504
Grand total	778,984	527,838

[1] *Mainly the produce of British India.*

This table shows that in 1913 68 per cent. of all the ground-nuts exported were shipped to France.

The returns of the imports into France during the same year record the arrival of 532,087 metric tons, which shows that the above table is not far from complete. Some of the difference between the figures would be explained by exports of ground-nuts consigned to such places as Hong Kong and Singapore finding their way ultimately to France.

Germany appears second amongst the countries importing ground-nuts, with, however, only about 7 per cent. of the world's total. Netherlands, Belgium and Austria-Hungary follow in the order named.

Indian Trade in Ground-nuts

The Indian trade in ground-nuts, which had fallen very low at the end of last century, has since recovered, due largely to the introduction of disease-resisting varieties, and to the increase in demand throughout the world for edible oils, with a consequent great advance in price. The increased demand is stated to have been caused in recent years by the discovery of processes for refining the oil expressed from the nut, which in the case of Indian ground-nuts had previously been suitable only for soap making, but is now an important article of food, competing with olive oil and refined cotton-seed oil as a salad oil, and entering largely into the composition of margarine.

The quantity and value of ground-nuts exported from India for the years 1904–5 and 1913–14 were :

1904–5.		1913–14.	
Quantity.	Value.	Quantity	Value.
Tons.	£	*Tons.*	£
83,700	647,000	277,900	3,254,000

Average f.o.b. value in India per ton, 1904–5, £7 10*s.*; 1913–15, £11 14*s.*

The export of ground-nuts, largely produced in British India, from the French port of Pondicherry, which in recent years has averaged about 86,000 tons, is not included in the British-Indian export figures.

The crop area and yield in India for 1914–15 was estimated at 2,413,000 acres and 947,000 tons of nuts in shell, giving an average yield of 879 lb. per acre. The yield of the 1913–14 crop was estimated at 749,000 tons.

The quantity and destination of exports for 1913–14, 1914–15, 1915–16 and 1916–17 were as follows :

	1913–14. *Tons.*	1914–15. *Tons.*	1915–16. *Tons.*	1916–17. *Tons.*
United Kingdom .	480	4,348	2,520	—[1]
Belgium . . .	16,608	3,243	—	—
France . . .	222,380	109,108	165,799	119,439
Italy . . .	1,225	6,353	2,928	—[1]
Germany . .	9,436	3,790	—	—
Austria-Hungary .	10,706	6,972	—	—
Other countries .	17,072	4,508	4,196	24,355
Total . .	277,907	138,322	175,443	143,794

[1] *Figures not available.*

The trade was affected by the war, and the reduction was due to the lack of transport facilities, high freights and the suspension of demand on the Marseilles market, where practically all the oil mills had been closed in August 1914, after the army mobilisation, and their output greatly reduced during the following months from September to December. A further difficulty was caused by the mobilisation of the Italian army, much of the labour used at Marseilles being Italian. Exports of oil and cake from France have also been prohibited to a large extent.

The lack of export facilities has not apparently affected ground-nut cultivation in India; the official forecast gives the area under cultivation in 1916–17 at 2,317,000 acres, an increase of over 400,000 on the average of the five preceding years. It is stated that the extension of cultivation has been stimulated by the steadily rising prices, and that in Madras the ground-nut crop is replacing cotton to some extent in the black cotton soils and is steadily spreading in the red soils.

Ground-nut Forecast for India

Province.	1915–16. *Acres.*	1916–17. *Acres.*
Madras	1,145,000	1,833,000
Bombay	266,000	226,000
Burma	262,000	258,000
Total	1,673,000	2,317,000

In 1850 about 4,000 acres were under ground-nuts in the Arcot District of the Madras Presidency, but it was many years before it was recognised as a commercial crop. In 1882, 73,000 acres were under ground-nuts, and in 1891 this had advanced to 279,000 acres. The bulk of the export trade, in the early years, was carried on through the port of Pondicherry to Marseilles, where the value of the ground-nut was first recognised.

After 1891 disease made ravages in the indigenous variety of nut then in general cultivation, and in 1897–8 the area under cultivation had been reduced to 94,000 acres. Efforts were made both by Government action and private enterprise to introduce better varieties, the Pondicherry Chamber of Commerce especially interesting

itself in the matter by bringing seed from Senegal. Eventually a variety obtained from Mozambique was found to be suitable and entirely replaced the original plant. It had the advantages of being better able to resist disease, of maturing within a shorter period, and of yielding a heavier crop, containing a larger percentage of oil. Within ten years of the introduction of the new variety the area under cultivation in Madras advanced from 94,000 acres to 838,000 acres, and the acreage has since been doubled. The cultivation of the nut soon spread to the neighbouring districts of the Bombay Presidency, but it was only taken up in Burma within the last fifteen years, and has made great progress.

The following figures show that India is a large consumer of ground-nuts :

	1913–14. Tons.	1914–15. Tons.	1915–16. Tons.
Crop outturn . . .	749,000	947,000	1,058,000
Exports, including those from Pondicherry . .	364,000	190,000	218,000
Balance . . .	385,000	757,000	840,000

Owing to the dislocation of the export trade the bulk of the 1914–15 crop remained in India ; it would appear, however, from the trade reports that although there were difficulties at first, a local market was found for the surplus. The yield in Burma for 1915–16 was estimated at 116,000 tons, and the exports from Burma for the last three years were : 1913–14, 26,900 tons ; 1914–15, 1,900 tons ; 1915–16, nil. Notwithstanding the fact that the entire outturn for 1915–16 and the bulk of the 1914–15 crop were available for consumption in the Province, over 2,000 tons of ground-nuts were imported from Madras in 1915–16. Burma also imported during the same year 420,000 gallons of ground-nut oil from Madras, exporting only 75,000 gallons of oil to the United Kingdom.

The export of ground-nut cake from Burma, principally to the United Kingdom, was : 1913–14, 30,000 tons ; 1914–15, 42,000 tons ; 1915–16, 38,000 tons.

It would appear that the check in the export of the nuts has given an impetus to the manufacture of oil in India

for local consumption, and the expansion in shipments of oil-cake supports this view.

In 1914–15 Calcutta imported 50,000 tons of ground-nuts from Madras against 7,500 tons in the previous year; it was stated that the oil from the ground-nut, being cheaper, was used in Bengal to mix with rape and mustard oil. Ordinarily Madras would have shipped these nuts to Marseilles.

The following table shows the quantities of ground-nuts, ground-nut oil and cake exported from India for five years:

		1911–12.	1912–13.	1913–14.	1914–15.	1915–16.
Ground-nuts . .	*tons*	191,000	243,000	278,000	138,000	175,000
Ground-nut cake .	*tons*	—[1]	62,000	62,000	64,000	82,000
Ground-nut oil	*gallons*	179,000	227,000	288,000	223,000	373,000
Ground-nuts from Pondicherry . .	*tons*	94,000	110,000	86,000	51,000	42,000

[1] *Not separately shown until* 1912–13.

Up to 1913-14 the exports of ground-nuts were rapidly increasing. France was the chief customer, and for the four years 1910–11 to 1913–14 took on an average about 80 per cent. of the total exports. Belgium followed with less than eight per cent. (more than half of which was re-exported to Germany), and Germany and Austria-Hungary each with about three per cent. In 1914–15 the United Kingdom and Italy commenced to take an interest in the trade.

The Indian trade statistics do not distinguish between shelled and unshelled ground-nuts, but in order to save freight the bulk of the nuts are shelled before shipment.

In Europe the best grades of oil are made from nuts shipped in the shells and decorticated here, as with these there is less spoilage during the voyage. It is stated that the shelled nuts shipped from Madras arrive at Marseilles in a very bad condition, and that the oil obtained from them is practically all used for soap manufacture. Recently, however, it has been stated that even this oil is refined for edible purposes. This question is receiving attention in Madras; the heated condition of the ground-nuts on arrival is attributed to the local method adopted of damping the nuts to facilitate shelling, and then not properly drying

the kernels. Efforts are being made to introduce machines for shelling nuts, and already "machine-shelled" nuts are at a premium at ports of shipment. The Madras trade further suffers from the want of facilities afforded at the minor ports, from which the bulk of the nuts are shipped. The average quantities of ground-nuts exported from the various ports serving Madras during the five years 1911–12 to 1915–16 were as follows:

	Tons.	Per cent.		Tons.	Per cent.
Pondicherry	75,000	32·2	Porto Novo	24,000	10·3
Madras	52,000	22·2	Other ports	6,000	2·5
Cuddalore	51,000	21·6	Total	214,000	100·0
Negapatam	26,000	11·2			

Madras is the only port at which cargo is shipped direct from the wharf to the steamer. At the other ports steamers have to lie a long distance from the shore, and, when weather permits, the cargo is shipped either in surf boats or lighters, and is often damaged in the process. The reason why greater advantage is not taken of the facilities offered at Madras is said to be that the railway system serving the ground-nut districts does not run into Madras; there is, however, a project for bringing the line into Madras. This question has been taken up by the Chairman of the Madras Port Trust. It is proposed to provide storage accommodation, and facilities for shelling and drying the nuts before shipment. If these proposals are carried out and the trade diverted to Madras, the nuts will be handled and shipped under better conditions to the advantage of both the grower and the trader. Certain improvements have already been effected and a much larger proportion of the ground-nuts produced in the Presidency is now shipped from the port of Madras, as is indicated in the following table showing the exports in 1915–16:

	Tons.	Per cent.		Tons.	Per cent.
Madras	75,636	39·0	Porto Novo	12,476	6·4
Cuddalore	42,923	22·3	Other ports	396	0·2
Pondicherry	42,238	21·9	Total	193,474	100·0
Negapatam	19,805	10·2			

The season for the export of ground-nuts from Madras is between the months of October and March.

The following table shows the principal customers for the ground-nut cake exported from India :

	1912–13. *Tons.*	1913–14. *Tons.*	1914–15. *Tons.*	1915–16. *Tons.*
United Kingdom .	25,000	33,000	44,000	43,040
Ceylon . . .	17,000	15,000	14,000	35,000
Germany . .	17,000	14,000	4,000	—

The United Kingdom took practically all her supplies from Burma, where the oil-crushing industry is apparently being developed on sound lines. All the cake imported from the East Indies is known in the home market as "Coromandel," as distinct from "Rufisque," a cake made from the West African nut. Ceylon obtains her supplies from Madras, and it is understood that the cake is largely used as a manure for tea. The quantity of cake produced and used in India is not known, but it must be very large, as the following facts will show. During the last pre-war year, 1913–14, the ground-nut crop in India was estimated at 749,000 tons, of which 364,000 tons were exported (including exports from Pondicherry), leaving a balance in India of 385,000 tons. Burma's share of the crop was 88,000 tons, of which 27,000 were exported and 61,000 tons retained ; in the same year Burma exported 30,000 tons of cake. The rest of India retained 324,000 tons of nuts and exported only 32,000 tons of cake. In 1914–15, when the quantity of nuts retained in India was 757,000 tons, Burma exported 42,000 tons of cake and the rest of India 20,000 tons only. In India, oil-cakes, or "poonacs," are largely used for manure. This question was discussed at the Agricultural and Trade Conference held in Madras in December 1914. The officers of the Agricultural Department stated that the use of poonacs as manures for sugar-cane and for wet lands was spreading, and they considered this beneficial from an economic point of view, as it would lessen the call on cattle manure and liberate its use for other lands. It was estimated that four-fifths of the ground-nut cake produced is used as manure and one-fifth as fodder. In Europe ground-nut cake is regarded as a very valuable cattle fodder, and the manure produced by the animals fed on the cake is exceptionally rich in

constituents of value to the farmer ; but even in Franc much of the cake from ground-nuts is used as a manur due to the bad condition in which the nuts arrive. At th Madras Conference the question of the indirect manuria value of ground-nut cake was not discussed. Conditior in India, however, where the feeding of cattle is a minc consideration, are quite different from those existing i Europe. In places where village oil-presses are worke the cultivator probably finds it economical to purchase th cake for manure. The use of oil-cakes suitable for use a feeding-cakes as direct manures is not economical whe cattle are raised and cheaper manures are available, and th continuance of this mode of use should not be encourage Burma exports practically all the ground-nut cake pr duced in the province, and she contributes more tha half the cotton cake exported from India.

The exports from India of ground-nut oil have bee very small, and have been confined to the supplies se from Madras for the use of Indian coolies working Ceylon and Mauritius. In 1915–16, however, Burma se 75,000 gallons to the United Kingdom. Ground-nut oil largely produced and used in India for domestic purpose

General

The position of the Indian trade in ground-nuts, ther fore, is that the bulk of the Indian exports are taken France, and that there is a large and increasing use India itself. In 1914 when war broke out and the Fren market for ground nuts almost ceased to exist, the Tec nical Information Bureau of the Imperial Institute issu a statement on the subject of ground-nuts to oil-se crushers in the United Kingdom. Fair quantities ground-nuts are now being crushed in the United Kingdo and there is a prospect of the demand increasing, b hitherto it has been met by imports from the West Afric Colonies and China rather than from India, mainly becau of the bad condition of the Indian shelled nuts, to whi reference is made above.

The total imports of ground-nuts into the Unit Kingdom during the first ten months of 1917 amount

to 127,594 tons, valued at nearly £3,500,000, whilst the re-exports during this period amounted to only 1,370 tons, valued at about £30,000. Prior to 1917 the Trade Returns of the United Kingdom do not show the imports of ground-nuts separately.

Sesame Seed and Oil (*Sesamum indicum*)

Sesamum indicum is an annual plant, which thrives both in the tropical and sub-tropical regions of the world, and produces a small seed rich in oil, known commercially as til, gingelly, or sesame oil. It is cultivated extensively in India, China, and other countries in the Far East, in Asia Minor, Egypt, and in many parts of Africa, also in the tropical and sub-tropical regions of America. In most of these countries the crop is grown for local consumption and the seed is exported on a large scale from comparatively few countries, of which India and China are by far the most important.

Trade in Sesame Seed

The export of sesame seed from the chief producing countries in the last year for which statistics are available prior to the war were as follows:

From	Quantity. *Tons.*	Value. £	Chief countries of destination.
India (1913–14) . . .	112,200	1,796,841	Belgium, France, Austria, Germany, Italy.
Sudan (1913) . . .	6,750	107,672	Egypt (684 tons were re-exported).
East Africa Protectorate (1913–14) . . .	3,800	58,564	Germany, India, Italy.
Uganda (1913–14) . .	900	10,449	Not stated.
China (1913) . . .	121,100	1,868,717	Holland, Germany.
Manchuria (Darien) (1913) .	2,000	36,481	Japan.
Indo-China (1913) . .	1,250	12,464	Hong Kong.
French Guinea (1913) .	750	6,099	France.
Portuguese East Africa (Porto Amelia) (1912) . .	1,300	13,689	Not stated.
German East Africa (1912) .	1,850	26,186	Zanzibar, Germany.
Turkey[1] (1912) . . .	12,200	—	Not stated.

[1] *Complete statistics for the export of sesame seed from Turkey are not available; the figures given represent the exports from the following ports of Syria and Asia Minor: Haifa, Jaffa, Mersina, Adalia, Ayas and Smyrna.*

The following table shows the average annual export o sesame seed from India, and the share taken by Franc during the last forty years :

Period.	Average quantity exported annually.	Average annual quantity consigned to France.
	Tons.	*Tons.*
1870–71 to 1874–75 . .	39,000	33,000
1875–76 to 1879–80 . .	66,000	50,000
1881–82 to 1884–85 . .	116,000	90,000
1885–86 to 1889–90 . .	100,000	70,000
1910–11 to 1914–15 . .	100,000	32,700

For many years France took practically the whole c the Indian exports ; within recent years, however, othe European countries have been drawing supplies from Indi The presence of sesame oil, when mixed with other oils c fats, can be detected by a simple chemical test, and for th reason the addition of this oil to margarine was mad obligatory in Germany, Austria, Belgium and Denmar since when a considerable sesame-oil industry has bee developed in these countries.

The following table shows the quantities and destin tions of the sesame seed exported from India :

Exports of Sesame Seed from India

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–1
Total quantity *tons*	94,800	77,800	112,200	46,700	13,800	83,6
„ value £	1,350,861	1,215,783	1,796,841	711,853	164,170	1,083,7
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Ton*
United Kingdom.	40	50	—	300	350	—
Total to British Empire . .	1,800	1,700	2,400	3,300	2,300	—
France . .	22,500	21,700	22,200	13,300	9,000	51,5
Belgium . .	21,500	17,500	33,800	5,500	—	—
Russia . .	100	200	1,300	4,100	—	—
Italy . .	13,000	5,400	14,300	9,500	1,700	8,4
Germany . .	10,600	8,500	16,500	1,900	—	—
Austria-Hungary.	22,300	19,000	19,300	4,000	—	—

[1] *Figures not available.*

The following table shows the quantities and destin tions of the sesame seed exported from China :

Exports of Sesame Seed from China

		1913.	1914.	1915.
Total quantity	*tons*	121,100	74,500	136,800
„ value	£	1,868,717	887,100	1,239,300
		Tons.	*Tons.*	*Tons.*
United Kingdom		1,500	5,300	42,100
France		—	150	10,500
Belgium		830	150	—
Italy		6,550	4,000	42,000
Russia		500	500	2,000
Japan		4,500	6,900	13,900
Germany		41,200	23,200	—
Austria-Hungary		4,100	4,700	—
Denmark		—	5,600	17,500
Holland		60,300	22,500	4,100

It is only within the last ten years that China has developed a large and steady export trade in this seed.

The total imports of sesame seed into Europe in 1913 amounted to roughly 250,000 tons, and the total imports into Germany for the same year were 114,174 tons. The quantities shipped direct to Germany from India and China in 1913 amounted to 57,700 tons, so it is evident that a part of the shipments consigned to Holland and Belgium must have been re-exported to Germany.

For many years France had virtually a monopoly of the crushing of this seed, but in 1913 her imports were 27,370 tons or 11 per cent. of the total European imports. Ground-nuts have to a great extent replaced sesame seed at Marseilles ; this may be due partly to the relative values of the two commodities, and to the fact that ground-nuts are largely obtained from the French African colonies. The price of sesame seed has advanced more rapidly in recent years than the price of ground-nuts, due largely to its enforced use in margarine in certain countries (*see* p. 124). In 1910–11 the relative export values of sesame seed and ground-nuts in India were £13 3*s*. and £11 respectively ; in 1913–14 the respective values were £16 and £11 14s. While the value of ground-nuts had advanced by less than 5 per cent., that of sesame seed was nearly 18 per cent. higher.

After the outbreak of war the Indian exports fell from 112,200 tons in 1913–14 to 46,700 tons in 1914–15, and to 13,800 tons in 1915–16, but in 1916–17 they rose to 83,600,

tons; the exports from China rose from 121,000 tons in 1913 and 74,500 in 1914 to 136,800 in 1915. Although the United Kingdom had hitherto imported very little sesame seed, the exports from China to this country in the early months of 1915 amounted to 42,000 tons. The prohibition against all re-exports of oil seeds from the United Kingdom largely stopped the Chinese export trade until autumn 1915, when improved shipping facilities allowed the accumulated stocks in China to be shipped at cheaper prices to Genoa. The exports from China to Italy in 1915 were 42,000 tons against 4,000 and 6,500 in the two previous years.

The following statement shows the declared export value of sesame seed at the time of export from India and China:

India.	Average value per ton.			China.	Average value per ton.			Equivalent of the Haikwan Tael in English money.	
	£	s.	d.		£	s.	d.	s.	d.
1910–11	13	3	0	1913	15	9	0	3	0¼
1911–12	14	6	0	1914	11	18	0	2	8¾
1912–13	15	12	0	1915	9	1	0	2	7⅛
1913–14	16	0	0						
1914–15	15	4	0						

The great decline in the value of the Chinese seed is only partly accounted for by the fall in the value of the Haikwan Tael. Chinese seed is said to be equal to the Indian, and in 1913 there was little difference in the relative values.

The trade in sesame seed in the United Kingdom is not recorded separately in the Board of Trade Returns prior to 1917. In the first ten months of this year 20,000 tons were imported and 14,000 tons re-exported; the countries of origin of the seed and the destination of the re-exports are not separately recorded. The small quantities hitherto consumed in this country were chiefly used in the manufacture of compound feeding-cakes, the large quantity of the oil in the seed helping to raise the percentage of oil in the mixed meal. In other European countries the finer qualities of the oil are largely used in the manufacture of margarine, and if the margarine industry is developed in the United Kingdom the demand for the seed should increase, more especially if the use of sesame cake for milk

production, and for fattening stock, can be popularised in this country.

The British oil industry could depend on a regular supply of seed, as the British Empire supplies nearly half the world's exportable surplus, and production can be largely increased. India always has a large available surplus, and with improved cultivation and better seed there is no doubt that larger shipments could be made. The Sudan and East Africa are also promising as future sources of supply.

Area and Yield in India

The following are official estimates of the area and yield of sesame grown as a pure crop in India :

	Area (acres).	Yield (tons).	Average yield per acre.
1915–16 . . .	4,008,000	392,000	219 lb.
1916–17 . . .	4,015,000	413,000	234 lb.

The estimate of the mixed crop, *i.e.* sesame grown interspersed with other crops, in the United Provinces, the only one which distinguishes the mixed from the pure crop, was :

	Area (acres).	Yield (tons).	Average yield per acre.
1915–16 . . .	1,100,000	90,000	183 lb.
1916–17 . . .	1,000,000	80,000	179 lb.

The above estimates do not include the crops grown in Burma, where over 1,000,000 acres are cultivated mainly in the dry zone, both as a separate and as a mixed crop. It is the most important oil-seed grown in Burma, and the crop is retained for local consumption.

The average yield per acre from the unmixed crops in 1916–17 varied from 364 lb. in Bihar and Orissa and 305 lb. in Bombay to 165 lb. in the Central Provinces. In the United Provinces the average yield per acre in the case of the pure and the mixed crop was 224 lb. and 179 lb. per acre respectively ; in the preceding year the corresponding figures were 269 lb. and 183 lb.

Sesame is very largely grown as a catch crop and mixed with other crops, and under the circumstances of its cul-

tivation it is obviously impossible to frame any reliable estimate of its outturn per acre, which varies greatly with the amount of seed sown. The average yield for the so-called unmixed sesame appears to be very low and could undoubtedly be improved. As much as 1,230 lb. per acre has been recorded in Bihar and Orissa, whilst the average yield per acre of sesame grown experimentally in the Federated Malay States from seed imported from India was estimated at 150 gantangs or 950 lb.

In Indo-China (Annam) the yield varies from 300 to 800 kilos per hectare, equivalent to about 265 to 440 lb. per acre, but with improved cultivation it is believed the outturn can be increased threefold.

Relative Value of Seed grown in Different Countries

The plant cultivated in the Levant produces a yellow seed of a larger size than the seed grown in India, and the finest quality of oil is obtained from this variety. The prices quoted for various descriptions of sesame seed at Marseilles during the first half of 1912 were as follows:

Bombay white, large seeds . .	43.50 fr. per 100 kilos.
,, ,, small ,, . . .	42.15 ,, ,,
,, bigarre, 50 per cent. white.	41.50 ,, ,,
Jaffa (Levant)	49.80 ,, ,,

Experiments might be made in India with Levant seed, and also with seed obtained from other parts of the world. It would appear that the varieties grown in India and Burma have deteriorated, and that better results, both as regards yield and quality, might be obtained by the introduction of fresh seed.

The following table gives the yield of oil said to be obtained on a large scale by the expression of sesame seeds. The seeds were expressed once or twice cold, and then once hot:

Description of seed.	*Yield per cent.*
Bombay seed, yellow or red	44 to 45
,, ,, bigarre (mixed)	42 to 44
Levant	47 to 48
Chinese	44 to 45

Sesame Oil

In India and other eastern countries the oil, expressed by primitive methods, is largely used for culinary purposes, for anointing the body, and for lamps. India retains for local consumption on an average about 400,000 tons of sesame seed a year, and Burma about 100,000 tons. The quantities produced and retained in China and other eastern countries are not known.

India exports on an average about 180,000 gallons of sesame oil, principally to Ceylon, Aden and the Persian Gulf.

The following table shows the exports of sesame oil from India during the five years 1911–12 to 1915–16:

Exports of Sesame Oil from India

		1911–12.	1912–13.	1913–14.	1914–15.	1915–16.
Total quantity	*gallons*	166,847	149,651	208,053	188,553	141,301
„ value	£	20,746	20,355	28,699	25,462	17,490
To		*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
United Kingdom		30	4,367	4,196	33	5,580
Aden and Dependencies		2,550	20,453	35,647	43,374	29,720
Ceylon		34,054	27,238	31,609	30,020	22,371
Straits Settlements		10,793	6,711	15,367	7,981	8,146
Mauritius and Dependencies		23,214	8,483	6,986	3,574	4,522
Total. British countries		80,480	86,747	111,193	97,171	80,642
Turkey in Asia		4,563	392	4,439	10,430	2,390[1]
German East Africa		2,394	5,151	10,443	3,993	—
Maskat Territory and Trucial Oman		68,234	49,887	63,510	63,599	48,284

[1] *To Persian Gulf ports.*

In 1916–17 219,834 gallons of sesame oil, valued at £27,695, were exported from India; particulars as to the destination of the oil in that year are not available.

Sesame Cake

There is an export of sesame cake from India, but details as to quantities and distribution are not given separately in the Trade Returns, being included with linseed and rape-seed cakes.

CASTOR SEED (*Ricinus communis*)

The castor-oil plant grows in many parts of the world, and, although it was long known and cultivated in India, it first came into prominence, as an article of commerce, early in the nineteenth century.

In 1804 the quantity and value of castor oil imported and sold at the East India sales was 20,207 lb., value £2,309, equivalent to about £1 2s. 6d per gallon. The export of the oil expanded rapidly, but the first recorded export of castor seed was in 1877–8, when 4,521 cwts. were shipped. Since then the character of the trade has changed, as the following figures will show :

Exports from India

	Castor oil. *Gallons.*	Castor seed. *Tons.*
1879–80 . . .	2,651,889	11,880
1889–90 . . .	2,664,990	44,731
1913–14 . . .	1,007,000	134,888

It is evident that the primitive methods adopted for expressing the oil in India could not compete with the methods introduced in Europe. The short-sighted policy of adulteration, commonly practised by the small dealers in India, also had an adverse influence on the Indian trade in the oil. The consumption of the oil in India is a large but unknown quantity. In India two principal varieties of the castor-oil plant are cultivated, the large and the small seeded. The medicinal oil is preferably obtained from the latter variety.

India is the chief source of supply of castor seed, and has in fact a practical monopoly of the world's export trade in this seed. The United States grow the plant for their own requirements, but also import large quantities of Indian seed. Small quantities have been imported into the United Kingdom from Brazil. The plant is cultivated in Manchuria and the seed crushed at Newchang (China). The exports of the oil from Newchang averaged 34,510 cwts. (about 390,000 gallons) for the years 1907–11. In 1912 the quantity and value of the oil exported was 42,885 cwts. and £46,399. The destinations are not mentioned in the

Consular report from which the above information was obtained. Java and Indo-China are now growing the seed on a commercial scale, and attempts are being made to cultivate the plant in Russia and in the Transvaal and other parts of South Africa. The plant is found in Ceylon, the Congo, Uganda, East Africa, Rhodesia and elsewhere, but is not yet of commercial importance there.

The following table shows the export of castor seed from India in recent years :

Exports of Castor Seed from India

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Total quantity, *tons*	120,194	110,630	134,888	82,815	87,948	92,447
,, value . £	1,178,462	1,092,177	1,336,649	773,289	802,185	957,201
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .	55,463	51,120	55,675	35,284	41,458	39,008
Total, British Empire .	55,713	51,497	56,273	35,647	41,867	—[1]
Belgium . .	14,415	10,209	14,822	5,669	—	—
France . .	16,621	16,157	20,989	11,584	14,128	16,552
Italy . .	13,073	6,461	11,789	11,203	7,788	10,585
United States .	15,101	20,018	20,279	16,083	17,721	21,067
Germany . .	3,684	5,522	9,761	732	—	—
Austria-Hungary .	100	75	—	145	—	—
Spain . . .	960	466	975	1,300	1,834	—[1]

[1] *Figures not available.*

The United Kingdom absorbs nearly half the trade, but re-exports considerable quantities of the seed ; for the three years 1911–13 her re-exports averaged 16,000 tons, shipped principally to Russia and to the United States.

The total imports of castor seed into the United Kingdom and the re-exports for the years 1911–16 were as follows :

	1911. *Tons.*	1912. *Tons.*	1913. *Tons.*	1914. *Tons.*	1915. *Tons.*	1916. *Tons.*
Imports . .	64,957	55,772	60,276	50,834	27,815	40,951
Re-exports .	22,114	13,373	12,826	9,959	4,628	5,737
Balance . .	42,843	43,399	47,450	40,875	23,187	35,214

The high-water mark of the Indian trade was reached in the year 1913–14, when France and Germany especially increased their demands. There has been a temporary set-back in trade due to the war, and this may lead to an increase in the production of oil in India. The bulk of the seed is exported from Bombay.

Castor Oil

Exports of Castor Oil from India*

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Total quantity, *galls.*	1,404,403	954,495	1,007,001	898,269	1,451,655	1,723,469
„ value . £	131,221	90,285	92,504	83,550	129,301	174,110
To	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
United Kingdom .	149,094	112,688	87,256	53,960	698,280	1,121,735
Australia . .	571,783	298,873	360,252	301,780	131,877	228,528 (Australia and New Zealand)
New Zealand . .	186,818	142,119	146,659	168,336	212,515	
Union of South Africa	133,909	82,571	59,659	57,490	73,291	—[1]
Mauritius . .	109,233	89,309	92,050	104,654	118,696	—[1]
Straits Settlements .	107,518	119,186	141,414	108,120	91,740	85,970
Ceylon	76,628	68,699	73,730	51,524	66,872	—[1]
Total, British Empire	1,346,397	926,742	971,711	853,258	1,408,030	—[1]

[1] *Figures not available.*

Australia and New Zealand are normally the chief customers. The United Kingdom is the only European country which takes notable supplies from India. Of other countries of the Empire to which the oil is sent the chief are the Straits Settlements, Mauritius, Union of South Africa and Ceylon. In 1916–17 the exports rose to 1,723,469 gallons, valued at £174,110, and in that year, as well as in 1915–16, the United Kingdom took much larger supplies than formerly. The war, with the consequent rise of freight charges, has given the Indian oil industry an opportunity of increasing the production of oil rather than seed for export. The bulk of the oil is exported from Calcutta. Castor-oil mills are worked in many parts of India, as the oil is largely used by the people of the country and the cake finds a ready market as manure. The oil is chiefly used in India for burning in lamps, as a lubricant and for dressing leather, and in the manufacture of Turkey-red oil. Castor oil has largely been replaced by kerosene as an illuminant in India, and it has also felt the competition of mineral oils for lubricating purposes.

Imports of Castor Oil into the United Kingdom

	1911.	1912.	1913.	1914.	1915.	1916.
Total quantity, *galls.*	433,376	313,206	324,568	196,040	177,016	1,322,632
„ value . £	57,398	40,122	41,875	25,542	28,261	249,125
From	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*	*Gallons.*
Belgium . .	134,328	84,448	109,504	51,040	—	—
France . .	77,024	72,404	78,880	52,896	53,128	1,160
Italy . . .	35,032	31,784	26,680	21,808	2,320	8,584
Other foreign countries . .	27,608	23,432	32,480	22,040	3,016	92,336
British Possessions .	159,384	101,152	77,024	48,256	118,552	1,220,552

The Board of Trade Returns do not specify the British countries from which the United Kingdom imports castor oil, but it is evident from the Indian export figures that India supplies the bulk (cf. table on p. 132). The quantities of castor oil re-exported from the United Kingdom are insignificant, but fair quantities of home-produced oil are exported.

Exports of Castor Oil—Manufacture of the United Kingdom

		1913.	1914.	1915.	1916.
Total quantity	*gallons*	2,509,776	1,789,880	710,848	715,488
,, value	£	301,839	202,025	109,101	175,321
To		*Gallons.*[1]	*Gallons.*[1]	*Gallons.*[1]	*Gallons.*[1]
Russia		2,088	15,544	122,032	102,080
Germany		1,551,152	926,144	—	—
Netherlands		413,888	244,528	57,536	6,264
Belgium		87,464	39,672	—	—
France		45,936	48,024	126,672	195,808
United States		12,296	186,528	34,104	94,888
Other foreign countries		208,104	219,472	164,256	69,368
Canada		103,704	50,344	104,168	116,000
Union of South Africa		22,968	13,224	29,000	25,288
Other British countries		41,296	46,400	73,080	105,792

[1] 232 *gallons of castor oil* = 1 *ton.*

Prior to 1913 exports of castor oil were shown under " other seed oils "; for the years 1911 and 1912 the total quantities entered under " other seed oils " were 1,702 tons (equivalent to 394,864 gallons) and 5,722 tons (equivalent to 1,327,504 gallons). For the years 1913, 1914, 1915, and 1916, when castor oil was separately recorded, the quantities were 2,509,776, 1,789,880, 710,848 and 698,320 gallons respectively. From this it would appear that the large export trade in castor oil in 1913 and 1914 was a new development. It would be interesting to ascertain why Germany took such large supplies of oil, amounting to nearly 2,500,000 gallons in 1913 and the first half of 1914. In the year 1913–14 she also drew from India nearly 10,000 tons of castor seed, more than double the average of the two preceding years. In 1913 the declared value f.o.b. of the oil shipped to Germany from the United Kingdom was £27 12*s.* per ton, whereas the value c.i.f. of the oil imported from Italy and France was £33 2*s.* 7*d.* and £32 4*s.* 9*d.* respectively. The oils imported from Italy and France must have been of a superior quality, as freight and other charges would not cover the difference

in values. At the outbreak of war the effect of the closing of the German market to the British product was at once felt. Prices were then low at about £28 per ton for the pharmaceutical quality of the British oil, but as all European countries had difficulties in obtaining seed from India, and there was a large demand for war purposes, prices gradually rose to about £58 per ton in December 1915. The total exports in 1915 amounted to 3,064 tons, and in 1916 to 3,084 tons. Hull took about 81 per cent. of the total quantity of castor seed imported into the United Kingdom during 1912–16.

Castor-seed Cake

The quantity of castor cake produced in India is not known; the exports averaged between 5,000 and 6,000 tons up to 1914–15 at an average f.o.b. value of £4 per ton, but increased in 1915–16. They are sent chiefly to Ceylon, where the cake is used as a manure for tea. In India castor cake on account of the large amount of nitrogen it contains is one of the most valued of oil-cakes as a manure, especially for crops of potato and sugar-cane; its value as a manure is also recognised by Indian tea planters. The cake has been used in India as fuel for stationary engines, and gas has also been obtained from the cake for lighting railway stations. It cannot, however, compete with cheap coal as a fuel. In China it is also appreciated as a manure, and the market gardeners in France consume from 15,000 to 18,000 tons annually, obtaining a part of their supplies from the United Kingdom. The export of cake from the United Kingdom is not separately recorded in the Trade Returns.

Character and Composition of Castor Seed, Oil and Cake

Castor seed contains from 46 to 53 per cent. of oil and yields by expression on a manufacturing scale about 40 per cent. of oil, about 33 per cent. being obtained at the first pressing. Most of the castor oil made in the United Kingdom is obtained by extraction with solvents.

Refined castor oil is almost colourless and has the following constants:

Specific gravity at $\frac{15 \cdot 5° C.}{15 \cdot 5° C.}$	0·959 to 0·969
Saponification value	176·7 to 186·6
Iodine value . . . *per cent.*	81·4 to 90·6
Reichert-Meissl value	1·1
Acetyl value	150·0

Castor oil differs from other vegetable oils in having a higher specific gravity and acetyl value. It is readily soluble in alcohol and almost insoluble in light petroleum, other vegetable oils being usually almost insoluble in alcohol and readily soluble in light petroleum. Castor oil, apart from its use in medicine, is chiefly employed as a lubricant and for the manufacture of Turkey-red oil for alizarine dyeing.

Castor seed contains a poisonous substance called ricin which remains in the cake or meal left after expression or extraction of the oil and renders this residue unsuitable for feeding live-stock. Processes have been devised for removing the ricin, but so far there is no record of castor cake being used for cattle food. Its chief use is as a manure.

The composition of castor cake varies according to the extent to which expression or extraction of the oil has been carried, and depends also on whether it has been obtained from the whole seed or the decorticated seed, as is shown in the following table :

	Castor cake made from— Whole seed.	Castor cake made from— Decorticated seed.	Castor meal extracted by solvents.
	Per cent.	*Per cent.*	*Per cent.*
Moisture . . .	9·85	10·38	11·75
Ash . . .	15·02	10·50	6·05
Oil . . .	5·25	8·75	1·10
Proteins . . .	20·44	46·37	30·62
Crude fibre } Carbohydrates } .	49·44	24·00	{36·52 {13·96
Phosphoric acid .	1·62	2·26	—

The castor cake used as a manure in Southern India contains, on the average, the following percentages of constituents of manurial value : nitrogen 6·37, phosphoric acid 2·55, potash 0·96.

Mowra, Mahua or Mowa Seed

India has a virtual monopoly in the export of mowra or mowa seeds, but there are in tropical countries several other kinds of seeds yielding solid fats that could probably be used for purposes similar to those for which mowra fat

is employed. The most important of these are "shea" nuts from West Africa, the Sudan, etc., which furnish "shea butter," and Illipé nuts from the Dutch East Indies and Borneo, from which tankawang fat or "Borneo tallow" is derived. Other possible competitors are the Sierra Leone butter seeds, *Pentadesma butyracea*, which are now beginning to be imported; Chinese "vegetable tallow" from the seeds of *Stillingia sebifera*; and "Piney tallow" obtained from the seeds of *Vateria indica*.

One of the uses of all these seeds is for the manufacture of edible fats, particularly chocolate fats, *i.e.* to replace or supplement the natural cocoa butter of cocoa beans in making cheap chocolate. It should be explained that the above statement is not to be taken as meaning that this practice is general among chocolate manufacturers. As is well known certain British chocolate manufacturers regard such substitutes as unjustifiable, and do not countenance them. There is, however, little doubt that the practice is increasing. The relative suitabilities of these fats for this purpose are shown in the following comparative table of their principal constants, in most cases as determined recently on samples examined in the laboratories of the Imperial Institute.

The nearer the constants of any one of these fats approach those of cocoa butter the more suitable is that fat as a cocoa-butter substitute.

Source of fat.	Specific gravity.	Melting point.	Saponification value.	Iodine value.	Solidifying point of fatty acids.
Indian mowra seeds:					
Bassia latifolia fat.	0·86	23°–31° C.	195	59	45° C.
B. longifolia fat .	0·86	42° C.	198	57	45° C.
B. butyracea fat .	0·86	39°–51° C.	197	40	51° C.
Borneo Illipé seeds:					
Borneo tallow .	0·85	32° C.	194	31	53° C.
Shea nuts:					
Shea butter . .	0·86	28°–29° C.	181	58	52° C.
Sierra Leone butter nuts:					
Sierra Leone butter	0·86	33° C.	190	42	51° C.
Stillingia sebifera seeds [1]:					
Chinese vegetable tallow . .	0·86	43°–46° C.	200–204	32·1–35·5	41°–53·5° C.
Vateria indica seeds [1]:					
Piney tallow .	0·89	37°–42° C.	188·7–191·9	37·8–39·6	54·8° C.
Cocoa nibs:					
Cocoa butter .	0·86	32° C.	192	35	49° C.

[1] *Lewkowitsch, "Chem. Tech. and Anal. of Oils, Fats and Waxes," Vol. II. 5th edition*, 1914.

It will be seen that all these fats are similar in character and, though each of them has certain minor disadvantages, they are all possible materials for the manufacture of chocolate fats. They are all, in addition, suitable for "stearin" candle manufacture. Most of the seeds have one disadvantage in common, viz. that the cakes or meals left after the extraction of the fats are bitter and believed to be harmful to animals. They cannot, therefore, be *recommended* for the production of feeding-cakes, though there appears to be no positive evidence that they are harmful. The value of the cakes and meals for feeding purposes requires further investigation.

The total trade in these seeds is small, and it is unlikely that the output can be increased largely, with the possible exception of shea nuts, because most of the trees bear seeds in a very uncertain fashion, and moreover do not as a rule occur close together. The crop is therefore always uncertain and collection difficult to organise. Further, the trees without exception are slow-growing, so that planting is not likely to be undertaken. It is possible, however, that with the development of transport facilities in Nigeria, Uganda and the Sudan there may be an increase in the output of shea nuts, and similar developments in Borneo may lead to an increase in the output of Illipé nuts. A considerable European trade in "vegetable tallow" already exists with China, and of recent years Malabar or "Piney" tallow from India has been receiving attention in Continental Europe. On the whole, however, it does not seem likely that the trade in oil-seeds of this type will ever rival in extent that of copra and palm kernels; at the same time the demand for such seeds is steadily increasing, and it will be worth while for India to increase the output of mowra seeds if that is possible.

Trade in Mowra Seeds

The following table shows the export and distribution of mowra seeds from India :

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.
Total quantity . *tons*	39,756	13,293	33,299	7,437	4,216
„ value . £	392,350	142,913	363,634	50,674	24,327
To	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .	303	—	—	5,312	851
Belgium . . .	7,325	3,055	4,439	750	—
France . . .	3,178	153	424	900	3,364
Italy . . .	800	—	—	300	—
Germany . . .	27,999	9,352	28,383	174	—
Holland . . .	150	731	50	—	—

Trade in Shea Nuts and Butter

The following tables show the quantity and chief destinations of the shea nuts and shea butter exported from Nigeria during recent years :

Exports of Shea Nuts from Nigeria

	1911.	1912.	1913.	1914.	1915.
Total quantity . *tons*	3,629	7,756	9,419	6,335	9,572
„ value . £	35,518	46,609	70,427	48,520	58,201
To	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .	2,358	4,294	4,781	3,479	6,171
United States . .	—	—	—	—	3,400
Germany . . .	174	193	2,987	2,856	—
Holland . . .	1,097	3,269	1,637	—	—

Exports of Shea Butter from Nigeria

Total quantity . *lb.*	555,602	402,242	268,592	254,555	1,151,290
„ value . £	4,978	4,797	4,044	4,323	11,622
To	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*
United Kingdom .	8,484	19,717	16,830	38,027	633,883
Gold Coast . .	521,642	346,271	234,339	213,538	507,003
Other countries .	25,476	36,254	17,423	2,990	10,404

The export of shea nuts at present takes place only from Nigeria. With improvement of railway facilities Nigerian supplies will increase. The tree (*Butyrospermum Parkii*) which yields the nuts occurs in the Gold Coast Colony and also in Ashanti, but owing to lack of transport facilities an export trade in shea nuts from these countries is not at present practicable, although large quantities of the nuts are available. Shea nuts are also produced in

Uganda and the Sudan, where they are known as "Lulu" nuts, but no exports of these nuts are recorded in the Trade Returns of those countries.

Trade in Illipé Nuts and Borneo Tallow

The exports and distribution of Illipé nuts from Singapore are shown in the following table :

Exports of Illipé Nuts from Singapore

		1911.	1912.	1913.	1914.	1915.
Total quantity .	*tons*	1,418	12,356	413	10,735	12,337
" value .	£	18,262	225,973	5,954	228,524	232,682
To		*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
United Kingdom .		336	4,927	46	1,872	6,012
Belgium . . .		661	2,968	316	5,247	—
France . . .		421	2,584	—	3,515	6,325
Germany . .		—	1,824	—	—	—
Other countries .		—	53	51	101	—

The chief countries of origin of the Illipé nuts re-exported from Singapore are shown in the following table :

Imports of Illipé Nuts into Singapore

		1911.	1912.	1913.	1914.	1915.
Total quantity .	*tons*	1,495	10,404	230	10,010	11,357
" value .	£	18,432	164,990	3,058	176,440	182,716
From		*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Sarawak . . .		344	4,359	1	2,298	3,482
Dutch Borneo . .		618	5,831	28	5,192	7,028
Sumatra . . .		521	212	197	2,466	833
Other countries .		12	2	4	54	14

The trees which yield Illipé nuts belong for the most part to the Nat. Ord. Dipterocarpaceæ and include several genera. Some of the nuts are, however, furnished by trees belonging to the Nat. Ord. Sapotaceæ, the order to which Bassia belongs, and these are therefore closely related to the trees yielding the mowra seeds of India. There is a small, non-European trade in Borneo tallow.

Trade in Chinese Tallow

The following table shows the quantities of vegetable tallow exported from China during recent years ; the seeds from which the vegetable tallow is prepared are apparently not exported as such.

Exports of Vegetable Tallow from China

		1911.	1912.	1913.	1914.	1915.
Total quantity .	*tons*	2,678	12,758	13,154	11,313	10,801
" value .	£	64,590	356,146	342,405	283,154	254,470
To		*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Great Britain .	.	1,104	4,467	4,059	1,074	4,285
Germany . .	.	140	594	1,621	2,049	—
Netherlands .	.	153	524	1,592	2,197	50
Belgium . .	.	—	672	1,047	716	—
France . .	.	53	1,154	1,540	2,095	1,056
Italy . .	.	758	3,131	1,754	1,576	1,765
United States .	.	277	1,847	1,145	1,403	3,486
Other countries	.	193	369	396	203	159

Chinese vegetable tallow is the hard fat which coats the seeds of *Stillingia sebifera.* The seeds themselves contain an oil—" Stillingia " oil, or " tallow-seed " oil. The hard fat separated from the seeds is known to European candle-makers as " prima " vegetable tallow. When the seeds together with their coating of fat are crushed, a mixture of vegetable tallow and Stillingia oil is obtained which is softer and has a lower melting-point (26° C. to 32° C.) than the true vegetable tallow ; this is known as " secunda " vegetable tallow.

The Chinese tallow-tree is cultivated in North-West India, and has become almost wild in some parts. It was at one time thought that the tallow might be produced on a commercial scale in India, but all the experiments so far made have proved that the cost of extracting the fat is too high to make the industry profitable.

Indian Trade in " Piney " or Malabar Tallow

The fat or tallow known as " Piney " or Malabar tallow is derived from the seeds of *Vateria indica,* a large evergreen of the forests of the Western Ghats from Kanara

to Travancore. The fat is extracted by grinding the roasted seeds and boiling the meal with water ; the melted fat then rises to the surface and is skimmed off.

Locally the fat is used for the manufacture of candles and for adulterating ghi and also in medicine.

No export of this product is shown in the Indian Trade Returns, but it is stated in a United States Consular Report that prior to the war it was employed on the Continent in confectionery, the chief market being Antwerp.

Trade in Sierra Leone Butter Seeds

At present the trade in the seeds of the Sierra Leone butter tree, *Pentadesma butyracea,* is small, and no exports are recorded in the Trade Returns of Sierra Leone. The solid fat obtained from the seeds is known locally in Sierra Leone as Mandingo butter, and is occasionally brought to Freetown for sale. Trial consignments are known to have been sold in this country.

The Indian Trade in Mowra Seeds

Within recent years a considerable export trade in mowra seeds has been developed in India, and about 90 per cent. of this trade passes through the port of Bombay. The most common species of the mowra tree in India is *Bassia latifolia,* a large deciduous tree, to be found in the forests and outskirts of villages in the Central Provinces, Chota Nagpur, and many parts of the Bombay Presidency and Western India. It also grows in the Western districts of Bengal and in Upper India. It thrives best in dry stony ground, and is conserved and protected by the Forest Department and by village communities.

Another species is *Bassia longifolia,* a large evergreen tree, common in Southern India and Ceylon. A third species is *Bassia butyracea,* which grows in the Sub-Himalayan tracts. It may be assumed that *Bassia latifolia* supplies the bulk of the mowra seed exported from Bombay, that the exports from Madras ports are obtained from *Bassia longifolia,* and those from Calcutta from *Bassia latifolia.*

The following table shows the exports of mowra seeds from each Indian port concerned :

	1910–11. Tons.	1911–12. Tons.	1912–13. Tons.	1913–14. Tons.	1914–15. Tons.	1915–16. Tons.
Bombay . .	15,104	36,223	12,671	31,705	6,905	4,050
Calcutta . .	4,607	3,059	122	267	431	—
Madras ports .	1,072	474	500	1,327	101	166
Total .	20,783	39,756	13,293	33,299	7,437	4,216

The collection of mowra seeds is always a difficult problem, as the regions where the trees are most extensively found are generally inaccessible and sparsely inhabited. In some of the forests of the Bombay Presidency the seeds are collected departmentally ; the total quantity so collected in 1913–14 was, however, only 562 tons against the total exports of 33,299 tons for the same year. A statement made by the Forest Officer of North Khandesh that the crop seems to be poor and good in alternate years is borne out by the following statement of the quantities of seed exported during the last eight years :

Export of Mowra Seed from India

Year.	Tons.	Year.	Tons.
1907–08 . .	39,760	1911–12 . .	30,756
1908–09 . .	20,360	1912–13 . .	13,293
1909–10 . .	39,200	1913–14 . .	33,299
1910–11 . .	20,783	1914–15 . .	7,437

The crop for 1914–15 was said to have been a poor one, and the export trade was restricted by the war. It seems very probable that a large quantity of the seed is now lost in the jungle, where it either rots or is eaten by wild animals. To secure the collection of this material the industry, which is now a minor one, requires to be organised. Hitherto Germany has taken the bulk of the Indian supplies ; in 1913–14 she took 28,383 tons, or 85 per cent. of the total exports, and Belgium absorbed nearly the whole of the balance. In 1910–11 the exports to the United Kingdom amounted to 1,616 tons, but in the two subsequent years exports to this country stopped. In 1914–15 the exports to the United Kingdom were 5,312 tons, or about 70 per cent. of the total trade, but in 1915–16 it fell to 851 tons, or 20 per cent. of the total, the remaining 80 per cent. being sent to France. It is not known

whether the seed was retained for home consumption or re-exported, as mowra seed is not separately shown in the United Kingdom Trade Returns.

COPRA

In considering means of increasing the usage of Indian copra within the Empire it is necessary to bear in mind the fact that copra can be produced in practically any tropical country which has a seaboard, and that the quantity shipped from India, although important, is only one-seventh of the world's total exports.

The world's annual exportable surplus of copra is about 540,000 tons. This does not include copra crushed in India, Ceylon and elsewhere, and exported in the form of oil and cake. This exportable surplus of copra was made up in 1913 (the latest year for which normal figures are available) as follows:

Exports of Copra from the Principal Copra-producing Countries of the World, 1913

	Tons.
British Countries	157,527
Allied ,,	104,020
Enemy ,,	32,377
Neutral ,,	243,500
Total	537,424

From British Countries

Ceylon	55,865
India	38,192
Federated Malay States	9,269
Unfederated Malay States	19,208[1]
Seychelles	2,938
Tonga Islands Protectorate	3,426
Fiji	7,929
Papua	845[2]
Solomon Islands	4,196
Gilbert and Ellice Islands	3,500
East Africa Protectorate	1,564
Zanzibar	9,451
Gold Coast	629
Trinidad	515
Total	157,527

From Allied Countries

	Tons.
French Indo-China	5,645
French Oceania	9,011
New Caledonia	2,960
Portuguese East Africa	4,000[2]
Philippine Islands	80,904
Samoa (American)	1,500[2]
Total	104,020

From Enemy Countries

Samoa (German)	11,021[3]
E. Carolines, etc.	4,747[3]
German New Guinea	11,190[3]
W. Carolines, etc.	1,085[3]
Togoland	161[3]
German E. Africa	4,173[3]
Total	32,377

From Neutral Countries

Netherlands East Indies	243,500

[1] *Including an estimate of* 12,500 *tons for Johore.*
[2] *Estimated.* [3] 1912 *figures.*

Other countries whence a little copra is exported, regularly or occasionally, are Mexico, the Republic of Dominica, Haiti, Venezuela, Colombia, Honduras, Ecuador, Jamaica, British Guiana and British Honduras.

The share of India in this exportable surplus of copra for 1913 is, therefore, about 7 per cent., and that of the British Empire nearly 30 per cent.

The exports of copra from the British producing areas in 1914 and 1915 are shown in the following table so far as figures are available:

From	1914. *Tons.*	1915. *Tons.*
Ceylon	70,597	60,426
India	31,845	15,678
Federated Malay States	14,500	13,342
Unfederated Malay States	18,642	16,070
Seychelles	3,174	2,915
Tonga Islands Protectorate	3,500 [1]	3,500 [2]
Fiji	9,429	15,238
Papua	1,003 [1]	635 [1]
Solomon Islands	4,000 [1]	4,000 [2]
Gilbert and Ellice Islands	4,500	5,000
East Africa Protectorate	1,586	1,386
Zanzibar	9,978	10,286
Gold Coast	656	770
Trinidad	1,052	1,780
Jamaica	32	85
Total	174,484	151,111

[1] *Estimated.* [2] *Figures for preceding year.*

The chief importing countries for copra in 1913 were as follows:

	Imports. *Tons.*	Re-exports. *Tons.*	Retained. *Tons.*
United Kingdom	30,868	16,664	14,204
Australia	5,861	517	5,344
France	123,360	11,032	112,328
Russia	66,690	—	66,690
Belgium	19,552	6,958	12,594
Germany	196,449	549	195,900
Austria-Hungary	33,605	—	33,605
Holland	100,635	82,356	18,279
United States	15,298	—	15,298

It is clear from these figures that the chief copra-importing and using countries in normal times are Germany (195,900 tons) and France (112,328 tons).

The position of the United Kingdom, Holland and the United States has altered considerably during the war, and all these countries are now importing and crushing more copra.

	Imports.	Re-exports.	Retained.
	Tons.	*Tons.*	*Tons.*
United Kingdom.			
1913 . .	30,868	16,664	14,204
1914 . .	66,494	24,334[1]	42,160
1915 . .	118,540	75,111[1]	43,429
1916 . .	62,400	12,089	50,311
Holland.			
1913 . .	100,635	82,356	18,279
1914 . .	110,311	77,130	33,181
United States.			
1912–13 . .	15,298	—	15,298
1913–14 . .	20,284	—	20,284
1914–15 . .	40,243	79	40,164
1915–16 . .	49,142	57	49,085

1 *Chiefly to Holland.*

France and Russia, on the contrary, are importing and using less. The imports into Russia fell from 66,690 tons in 1913 to 38,309 tons in 1914.

The change of the position of the trade in Australia is shown in the following table:

	Imports.	Re-exports.	Retained.
	Tons.	*Tons.*	*Tons.*
1913 . .	5,861	517	5,344
1914–15 . .	16,356	327	16,029

Coconut Oil

In discussing the world's trade in copra, the export trade in coconut oil from copra-producing countries should not be overlooked. The amount of coconut oil exported from such countries depends to some extent on the relative prices of copra and coconut oil, the latter being made and exported in preference to copra when the price of the latter in the world's markets is relatively low. In some places, such as Seychelles and Zanzibar, manufacture is carried a step further, and coconut-oil soap is made for export in favourable times. There is, however, at present only an insignificant export of coconut oil from Seychelles and Zanzibar. The exportable surplus of coconut oil available

in the tropics[1] in 1912, 1913, 1914 and 1915 has been as follows:

Exports of Coconut Oil from the Principal Tropical producing Countries

	1912. Tons.	1913. Tons.	1914. Tons.	1915. Tons.
Ceylon	20,089	27,349	24,324	25,075
India	4,832	4,591	4,523	10,508
Philippines	½	4,931	11,754	13,251
Australia [2]	5,162	1,977	4,231	—

[2] *Oil expressed from imported copra. Up to and including* 1913 *the Australian trade year was the calendar year; in* 1914 *it began to date from July* 1.

The following table shows the latest available statistics of imports of coconut oil from all sources into the chief countries importing this oil. Figures for the last three years are not available for many countries:

Imports of Coconut Oil into Chief Importing Countries

	1912. Tons.	1913. Tons.	1914. Tons.	1915. Tons.	1916. Tons.
United Kingdom, unrefined	31,572	31,140	19,879	33,479	21,122
" " refined	30,087	27,337	15,471	16,167	7,747
United States [1]	20,601	22,546	33,208	28,185	29,468
France (metric tons) [2]	3,087	3,924	1,673	426	1,544
Holland	20,028	16,685	—	—	—
Belgium	1,749	1,285	—	—	—
Russia	—	397	—	—	—
Austria-Hungary	6,611	4,895	—	—	—
Germany	333	594	—	—	—

[1] *Returns for years* 1911–12, *etc., ending June* 30 *in each case.*
[2] *Imports of "huile de coco, de touloucouna, d'illippé, et de palmiste."*

To Sweden the following countries exported in 1913 the quantities named: India (1913–14), 494 tons; Ceylon, 170 tons; Germany, 851 tons; Belgium, 30 tons.

To Norway, Ceylon exported 2,031 tons in 1913 and India 12 tons in 1913–14.

The Trade in Copra and Coconut Oil in India

The export trade in copra from India has been steadily expanding in recent years. In 1904–5 the quantity exported was 7,800 tons, valued at £127,000, the average value being 16*s.* 3½*d.* per cwt. In 1913–14 it was 38,192 tons, valued at £1,039,000, the average value being

[1] Australia is included for convenience of discussion.

£1 7s. 2¾d. per cwt. In 1914–15, owing to the war, the exports fell by 6,346 tons, and the average value declined to £1 5s. per cwt. During the same period, however, there was an increase of nearly £100,000 in the value of coconut oil exported. The coconut palm grows freely in many parts of India, and there is a large local demand for the oil, which is supplied by village oil-mills. The Malabar coast of the Madras Presidency supplies, however, the bulk of the copra, coconut oil, and other products of the coconut palm which are exported from India. The following table shows the export of the several products of the coconut palm from India to countries overseas for the years 1913–14 and 1914–15:

Exports of Coconut Palm Products from India

		1913–14.		1914–15.	
		Quantity.	Value. £	Quantity.	Value. £
Coconuts	*number*	344,000	1,000	272,000	1,000
Coir fibre	*cwts.*	14,000	11,000	5,000	3,000
Coir manufactures	„	772,000	592,000	476,000	380,000
Cordage and rope	„	60,000	70,000	45,000	57,000
Copra	*tons*	38,000	1,039,000	32,000	822,000
Coconut cake (poonac)	*cwts.*	84,000	26,000	67,000	19,000
Coconut oil	*tons*[1]	4,510	155,000	7,540	246,000
Total value			£1,894,000		£1,528,000

[1] *Coconut oil is converted from gallons into tons at the rate of 242 gallons = 1 ton.*

The following figures show that while the exports of copra from India have advanced, those of coconut oil have declined. The revival of the export of coconut oil in 1914–15 was due to the war.

		1910–11.	1911–12.	1912–13.	1913–14.	1914–15.
Copra	*tons*	22,481	31,876	34,349	38,192	31,845
Coconut oil	„	7,994	8,955	4,006	4,510	7,540

During the same period Germany's share of the trade was as follows (as shown by the Indian export returns):

		1910–11.	1911–12.	1912–13.	1913–14.	1914–15.
Copra	*tons*	17,428	23,683	27,442	23,989	9,712
Coconut oil	„	2,935	2,414	677	668	362

Germany was therefore taking more copra and less oil. Before the war Germany also took the bulk of the coconut

cake exported from India, on an average about 5,000 tc a year.

THE WORLD'S TRADE IN INDIAN OIL-SEEDS

The principal data recorded in the Special Section this article concerning the oil-seeds in which India specially interested are summarised in the table on p. 1. The statistics are for the calendar year 1913, except in t case of India, where they are for the fiscal year endi March 31, 1914.

The figures for the total exports from producing cou tries are in most cases approximate only, owing to t absence of complete statistics for some of the countries

The net imports into the Continental countries represe the imports of "Special Trade," less the exports "Special Trade," as published in the Trade Returns the different countries. "Special Trade" is underst to mean, as regards imports, produce imported for ho consumption or manufacture, or which has beco nationalised by the payment of duty, and as rega exports produce which has been manufactured or some way improved in the country, or which has b nationalised by the payment of duty. In the case of United Kingdom, the figures are obtained by subtract the "Exports of Foreign and Colonial Merchandise" fr the total imports given in the Board of Trade Returns



cake exported from India, on an average about 5,000 to a year.

The World's Trade in Indian Oil-seeds

The principal data recorded in the Special Section this article concerning the oil-seeds in which India specially interested are summarised in the table on p. 14 The statistics are for the calendar year 1913, except in tl case of India, where they are for the fiscal year endin March 31, 1914.

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THE WORLD'S TRADE IN INDIAN OIL-SEEDS, 1913

(n.s.r. = not separately recorded)

Kind of seed.	Total exports from producing countries.	Exports from India 1913–14.		Net imports into chief consuming countries.						
				United Kingdom.	France.	Belgium.	Italy.	Holland.	Germany.	Austria-Hungary.
	Tons.	*Tons.*	*Per cent.*	*Tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*	*Metric tons.*
Cotton seed	858,000	284,000	33	615,000	18,000	n.s.r.	n.s.r.	n.s.r.	219,000	4,000
Linseed	1,808,000	414,000	23	603,000	236,000	197,000	45,000	200,000	560,000	63,000
Niger seed[1]	4,000	4,000	100	350	1,000	20	50	25	2,000	550
Rape seed and mustard seed	385,000	254,000	66	49,000	54,000	37,000	10,000	29,000	161,000	31,000
Poppy seed	25,000	19,000	76	n.s.r.	9,000	n.s.r.	n.s.r.	n.s.r.	12,000	3,000
Ground-nuts	779,000	360,000[2]	46	n.s.r.	474,000	n.s.r.	25,000	48,000	98,000	n.s.r.
Sesame seed	264,000	112,000	42	n.s.r.	20,000	n.s.r.		n.s.r.	116,000	26,000
Castor seed	135,000[3]	135,000	—	47,000	21,000[4]	15,000[4]	11,000	—	10,000[4]	—
Mowra seed[1]	33,000	33,000	100	—	400	4,500	—	50	28,000	—
Copra[5]	537,000	38,000	7	14,000	112,000	13,000	n.s.r.	18,000	196,000	34,000

[1] *The Trade Returns of the different countries do not show the imports of niger seed and mowra seed separately, and the figures given are the exports recorded in the Indian Trade Returns for 1913–14.*

[2] *Including exports from Pondicherry.*

[3] *Indian exports only.*

[4] *Exports recorded in the Indian Trade Returns for 1913–14; the imports of castor seed into these countries are not shown separately in the respective Trade Returns.*

[5] *The net imports into other important consuming countries were as follows: Russia, 67,000 tons; United States, 15,000 tons; Australia, 5,000 tons.*

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